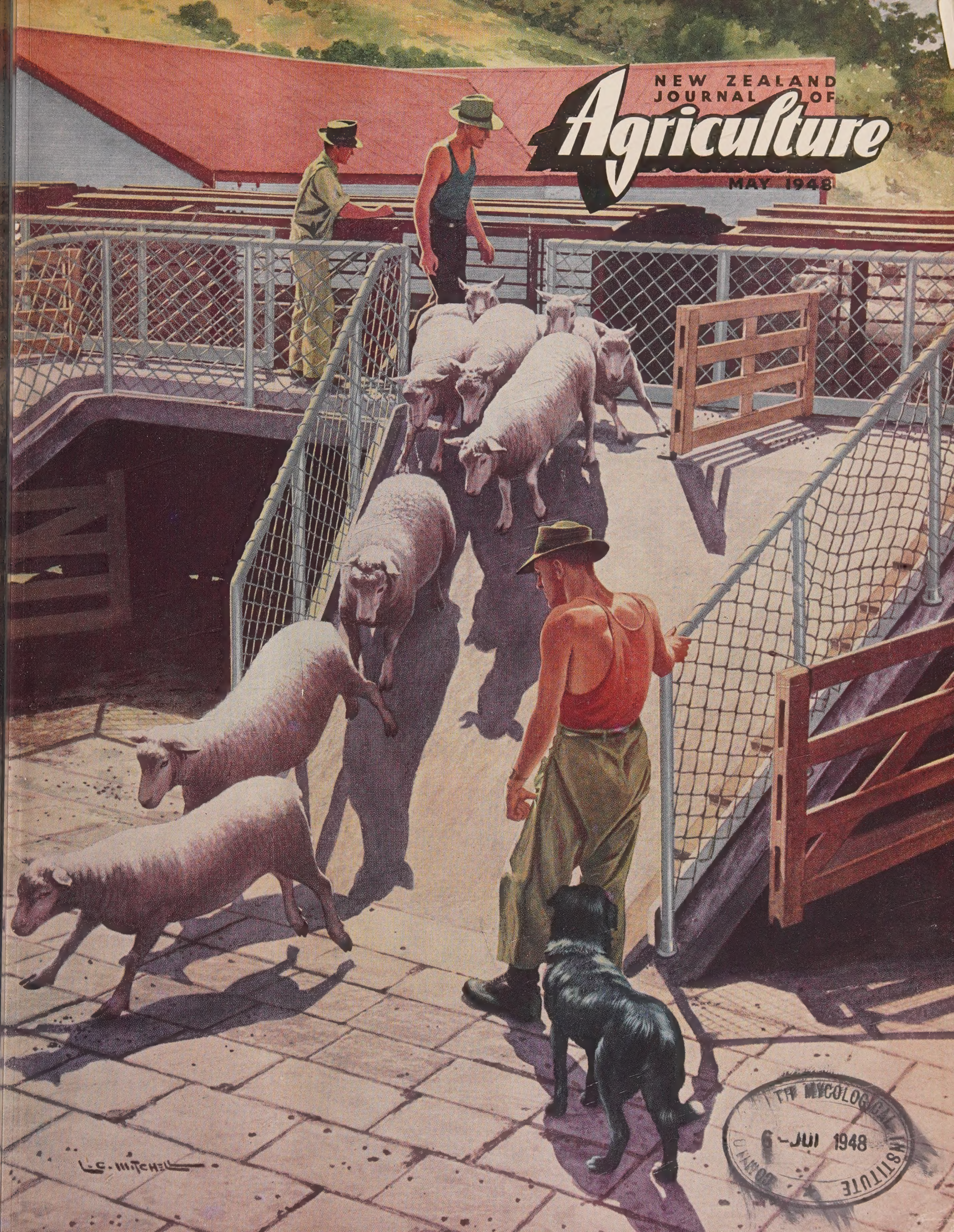
NEW ZEALAND
JOURNAL OF

Agriculture

MAY 1948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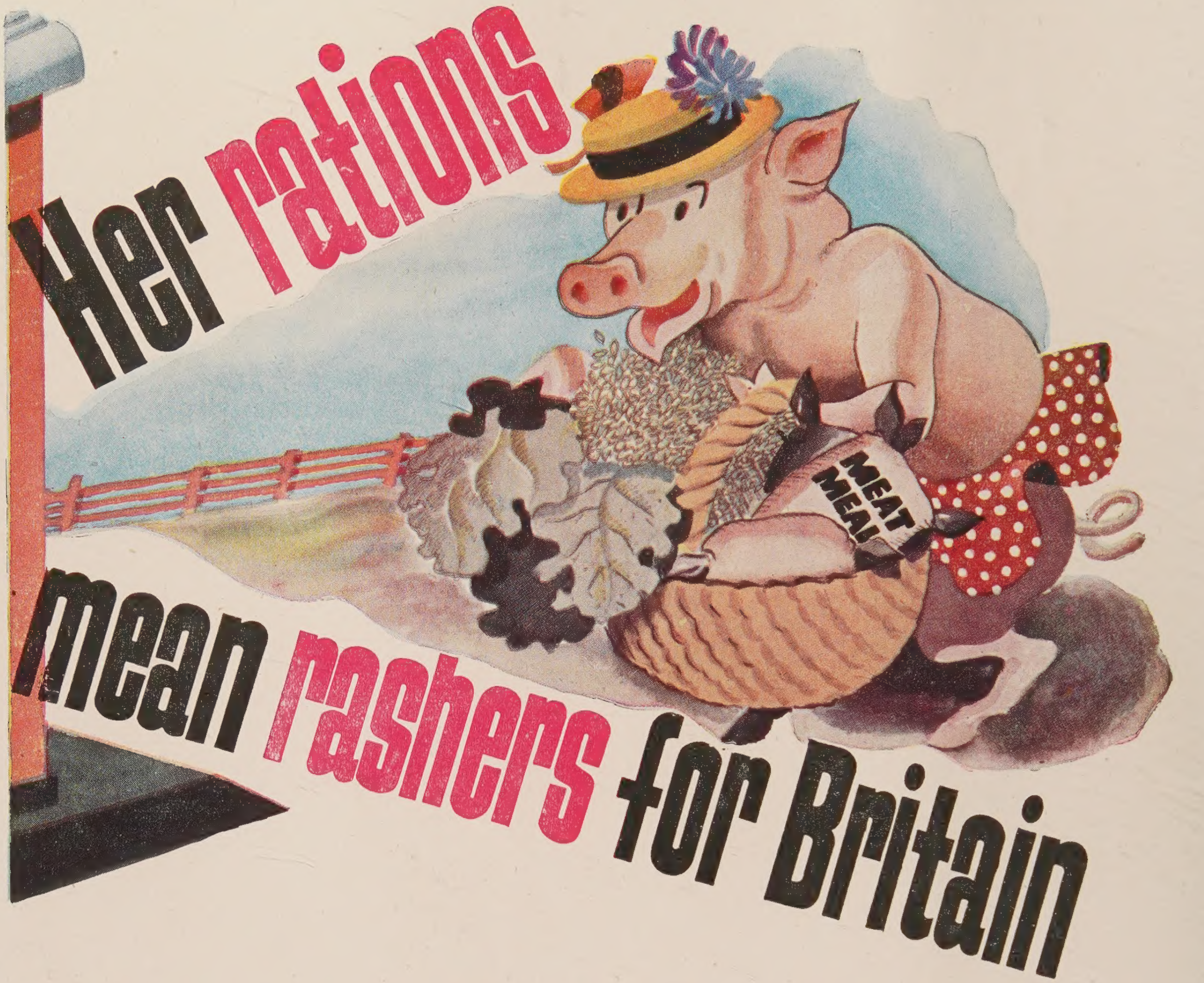
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Volume 76
Number 5
May 15,
1948.
(Established 1910)

NEW ZEALAND
JOURNAL OF
Agriculture

Published by
Direction
of
Hon. E. L. Cullen,
Minister of Agriculture.

This month's cover

The numbers of sheep and lambs killed for export meat have risen sharply in the past 20 years and recently greater impetus has been given to the export of meat by the urgent need of Britain for food. This month's cover, painted by L. C. Mitchell from a photograph by National Publicity Studios, shows sheep being unloaded at the Wellington Meat Export Company's freezing works at Ngahauranga, Wellington, one of the 38 meat-export slaughterhouses in New Zealand. Careful grading and inspection of the carcasses at the slaughterhouses ensure that the reputation of the Dominion's export meat is maintained.

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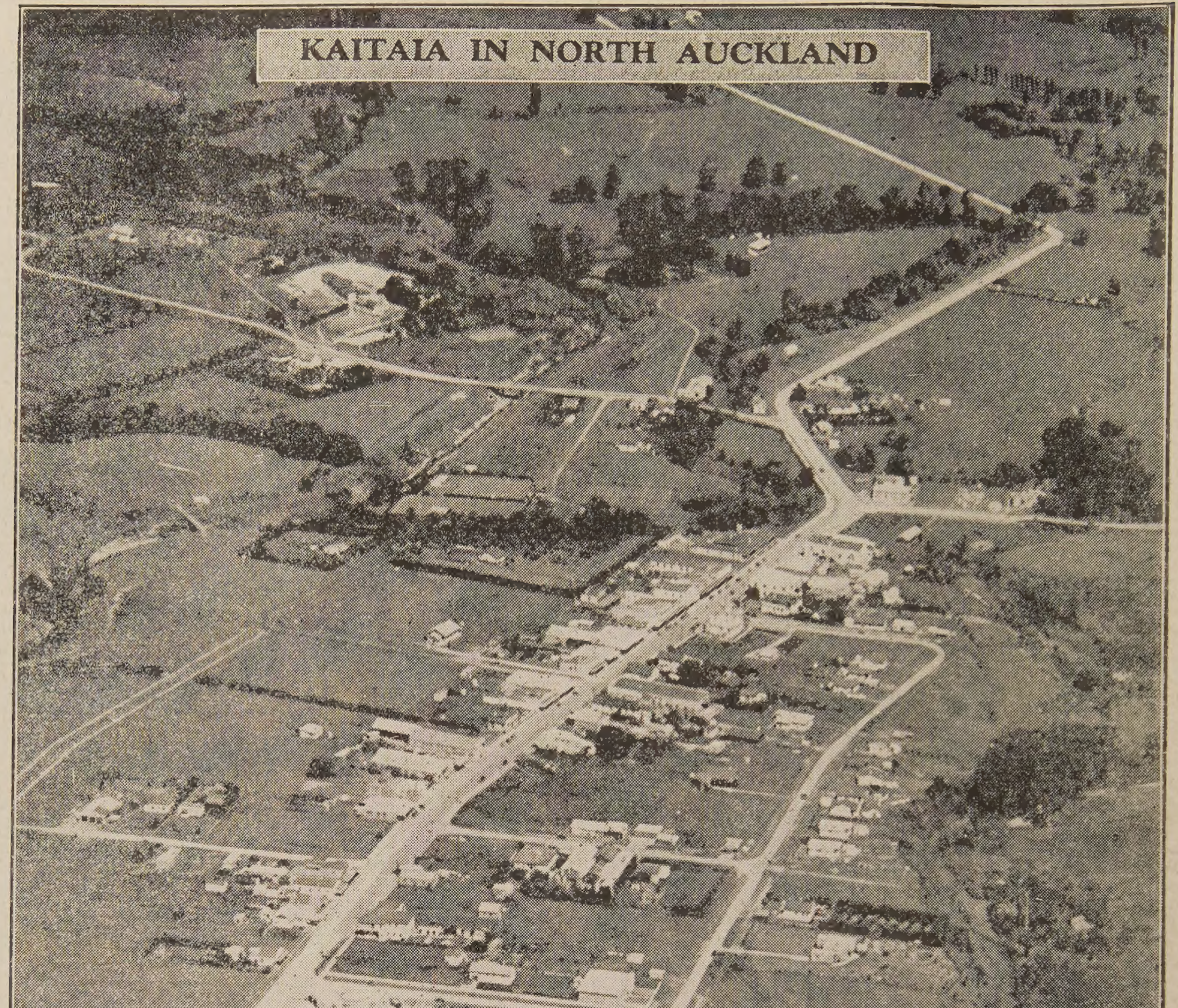
SUBSCRIPTION RATES

The *Journal* is issued monthly. The subscription within New Zealand is 2s. 6d. a year; the overseas subscription is 5s. The *Journal* may be ordered from any bookseller or newsagent, or direct from any office of the Department of Agriculture. Individual copies are available at 3d. a copy, post free.

REGISTERED AT THE G.P.O., WELLINGTON, AS A MAGAZINE.

KAITAIA IN NORTH AUCKLAND



About 200 miles north of Auckland, Kaitaia is the chief town of Mangonui County and a business and agricultural centre of the far north. The main type of farming in the district is dairying, which is carried out on the drained flats, river valleys, and rolling country, the hill country and less-developed areas being devoted to pastoral farming. The yield of export butter of the county last season reached more than 2500 tons.

[V. C. Browne photo.

Encouragement of the Phormium Industry

THE production of *Phormium tenax* was one of the earliest industries to reach economic importance in the Dominion; the yearly average value between 1866 and 1871 was £56,000, with a peak in 1870 of £132,578. The industry has had many vicissitudes; at one time more than 300 mills were in production, employing more than 3000 hands, but when the Second World War broke out production had reached the lowest point for many years. Even in the early years of the war the urgent necessity for increased production was not apparent, but after the entry of Japan the inevitability of manila fibre being cut off and the threat to supplies of jute woolpacks from India made it of supreme importance that something be done to stimulate production of phormium to replace manila for rope production and jute woolpacks with phormium packs. A scheme of subsidy payments to stabilise the cost of green leaf to the mill was therefore inaugurated.

Today the world shortage of hard fibres and the critical position of jute supplies from India have made it more than ever necessary to effect a much-needed stimulus to the growing and milling of phormium in the Dominion, and to meet this Cabinet has approved of the following measures for the rehabilitation of the industry:—

1. A guarantee by the Government to purchase the total annual production of phormium fibre at prices fixed from time to time.

2. The making available of finance to millers and others in amounts and on terms and conditions approved by the Minister of Finance on the recommendation of the Minister of Industries and Commerce.

3. Consideration of improved conditions of wages and accommodation for workers, together with the training of young men to fill key positions at the mills.

Satisfaction with Guaranteed Price

Millers throughout New Zealand have expressed satisfaction with these measures, particularly the guaranteed price, which has been based on a return to millers and growers of an adequate price for green leaf, generous wage scales, and a profit return equivalent to sheep grazing on comparative land. In other words, the measures which have now been carried out by the Government have placed the phormium industry on a basis comparable with other industries and with sheep grazing. It is certain that these measures have already given a needed stimulus to production and have kept in production certain millers who otherwise would have ceased operations.

The production of fibre and tow for the past five years was: 1941-42, 3371 tons; 1942-43, 3961 tons; 1943-44, 6637 tons; 1944-45, 4969 tons; 1945-46, 3496 tons; 1946-47, 3655 tons. When it is realised that a year's export has reached as high as 28,000 tons and that until 1929 the annual average was more than 10,000 tons it will be seen to what extent this natural industry has declined. However, I am hopeful that the past drift has been checked and that production will be progressively improved. The present utilisation of the Dominion's production of *Phormium tenax* is about 7000 tons a year, 4000 tons being used in the manufacture of rope, binder twine, baling twine, and lashings, and some 2000 tons in the manufacture of woolpacks, etc.

The immediate aim is an annual production of up to 10,000 tons of fibre and tow, as this quantity can be absorbed in manufacture within the Dominion as soon as labour becomes available. Only about 30 per cent. of the machine capacity of the woolpack factory is now in operation, equalling only 300,000 woolpacks a year, whereas with labour and material the total Dominion requirements of about 1,000,000 woolpacks a year can be manufactured here. A considerable expansion in other fibre products merely awaits development when labour and materials are available. The fibrous plaster industry in the past year has called for about 700 tons and the demand by upholsterers throughout New Zealand could not be met.

Research and Experiment

The Government has carried out a great deal of research and experiment with the object of developing different strains of leaf for different purposes. The leaf best suited for the manufacture of rope and binder twine is not always best suited for other purposes. Length of fibre, strength, and colour vary considerably in different strains, and on the development along lines suitable for each particular commodity will rest the ability of phormium to compete with sisal and manila for the making of rope and other products.

Study of disease has also entailed intensive research work, which has been carried out almost exclusively on the Moutoa Estate, which was acquired by the Government in 1940 and has been developed to maintain adequate leaf supplies to the woolpack factory at Foxton.

I feel that with the measures outlined the phormium industry has entered on an era of stability and that the guaranteed price offers conditions which will make this industry competitive with other basic industries.

EDWARD CULLEN, Minister of Agriculture.

CAUSE OF DIPPING LAMENESS IN SHEEP

By L. K. WHITTEN, *Parasitologist, Animal Research Station, Wallaceville.*

DURING the past three seasons a number of farmers in New Zealand have experienced outbreaks of lameness in sheep after dipping them in rotenone and "gammexane" preparations. The first cases were seen after rotenone dips, including those containing true derris root *(Derris elliptica)* and its wartime substitute *(Lonchocarpus)* from South America. Last year six farms experienced an apparently-identical condition after the use of a phenolic "gammexane" preparation. These cases were described and studied by J. W. McLean, of Canterbury Agricultural College. This year a large number of cases have followed the use of a non-phenolic "gammexane" paste dip and a small number after the use of a proprietary derris extract.

THE condition has occurred on only a small percentage of the farms where these materials have been used; in most instances they have given complete satisfaction. The incidence of lameness on individual farms has shown wide variation; one or two per cent. or up to 75 to 90 per cent. of a flock may be affected. In most cases between 5 and 20 per cent. of the sheep have become lame.

The lameness appears between the second and fourth day after dipping and its highest incidence has been in lambs and two-tooths which have been dipped in a bath which has stood for some days after the initial mix. The lameness becomes worse for three to four days after its first appearance, but thereafter a gradual improvement takes place and in one to three weeks after dipping all signs of lameness disappear. Few, if any, departures from this pattern have been observed.

On examination, the foot of a lame sheep shows very little abnormality. There is some swelling in the region of the coronet and fetlock, considerable heat in the affected part, and evidence of extreme pain within the hoof and immediately above it. Affected sheep lose condition rapidly during the period that they are lame.

Recent Investigations

The cause of the lameness has been investigated during recent weeks in collaboration with representatives of a dip-manufacturing firm and with the co-operation of many farmers who have experienced lameness in their flocks. The experiments have shown that the lameness is caused by a bacterial infection, the organism incriminated being *Erysipelothrix rhusiopathiae.*

As the materials used in the dips lack the antiseptic or bacteriostatic action of the older phenolic or arsenical preparations, a gross contamination of the used dip wash is allowed to take place. This heavily-contaminated fluid then allows an infection of the skin to occur wherever the skin surface is broken. An inflammatory condition is set up in the skin and extends to involve the soft structures within the hoof. An infection of this type results in an outpouring of inflammatory exudate which is responsible for the swelling of the affected part. Within the hoof little or no swelling is possible, and the increased pressure on the sensitive parts causes extreme pain and lameness.

Skin Abrasion Necessary

It has been shown quite clearly that skin abrasions are necessary for the infection to take place. Very small puncture wounds may be sufficient in some cases, but most infections occur through larger abrasions inflicted during dipping, which occur much more frequently than is generally realised.

Abrasion of the skin may occur during entry into the bath, and on a number of occasions there have been indications that this is a very fruitful source of injury. On one property a concrete slide into the bath had a large horizontal crack near the bottom on which a high proportion of the sheep's feet must have been injured.

Sheep may abrade their feet as they strike the side of the bath in swimming. It has been noticed that in some baths, especially circular ones, one foot has tended to be more frequently abraded than the others.

Another very common way for sheep to injure their legs is in the walk-out. When a sheep reaches the end of the bath it usually takes one or two steps on its knees, then two or three on the front of its knuckled-over fetlocks, before it finally staggers to stand normally on its feet. At this point the sheep may be carrying the extra weight of 50 to 75lb. or more in the wash held in the fleece. The additional weight would increase greatly the amount of damage done, especially if the concrete were rough or broken.

Sterilisation

A number of materials can be used to sterilise an infected bath or to prevent the development of the organism in the wash. The most satisfactory control would be obtained by the addition of such a material to the dip concentrate in the factory. Trials are in progress now to determine the most satisfactory and economical substance to use, and the manufacturers are confident that when the results of these trials are available the problem from the practical aspect will have been solved. It is hoped that a completely-satisfactory dip will be available for next dipping season.

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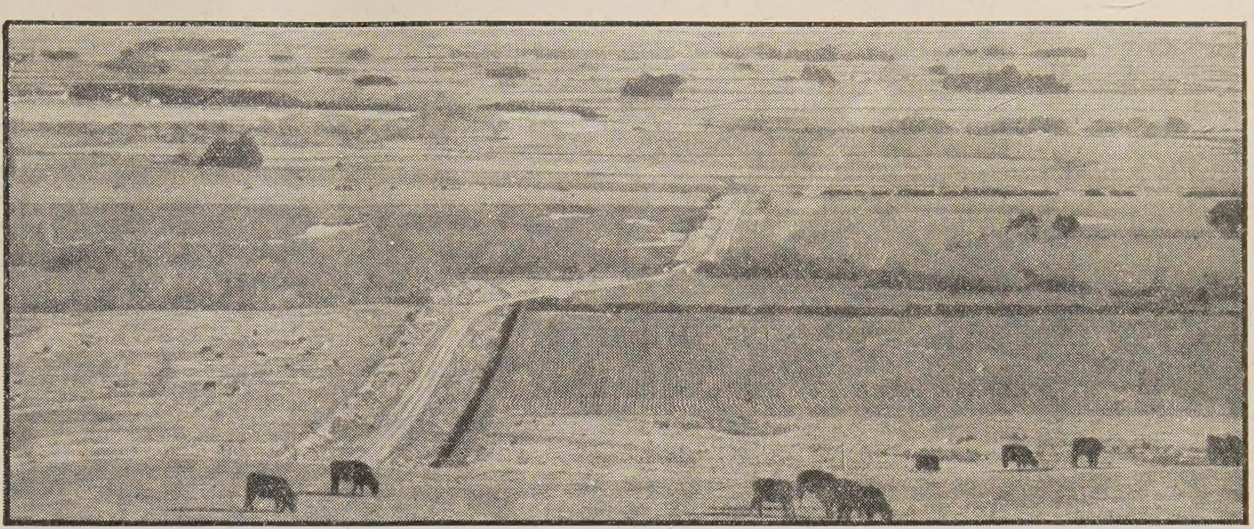
METEOROLOGICAL RECORDS FOR APRIL

TO provide farmers with information about chief characteristics of the weather in the month preceding each future issue of the "Journal," the following summary of records of temperature, rainfall, and sunshine will be published. These records are compiled by the New Zealand Meteorological Service from observations made at 22 meteorological stations in the Dominion. The figures for Waipapakauri are not included in this summary because they were not available at the time the "Journal" went to press.

Station	Height of station above M.S.L. (ft.)	Air temperatures in degrees (Fahrenheit)				Rainfall in inches					Bright sunshine hours
		Mean	Difference from normal	Absolute maximum and minimum		Total fall	No. of days of rain	Difference from normal	Maximum fall		
				Maximum	Minimum				Amount	Date	
Auckland	160	61.8	+ 0.6	73.0	43.5	2.98	19	— 0.86	0.45	17	166.0
Tauranga	10	59.0	+ 0.6	75.8	35.6	13.04	15	+ 8.32	8.97	17	191.6
Ruakura	131	57.2	— 0.1	76.5	31.5	3.16	17	— 0.56	0.72	1	166.3
Rotorua	980	56.1	+ 1.0	74.0	33.0	6.00	9	+ 1.49	2.50	17	
New Plymouth ..	160	59.2	+ 1.0	74.0	41.3	6.55	12	+ 1.89	1.54	17	197.9
Taihape	2157	53.2	+ 0.7	70.6	33.3	3.02	17	+ 0.22	0.61	20	
Gisborne	12	58.6	— 0.2	74.8	33.7	5.36	17	+ 1.93	1.94	17	150.3
Wanganui	72	58.4	+ 0.6	76.1	38.8	2.79	16	— 0.45	0.56	18	195.7
Palmerston North	110	57.6	+ 0.8	76.5	34.0	3.86	18	+ 0.49	1.85	20	170.4
Waingawa	350	55.0	— 0.3	73.6	27.7	3.35	19	+ 0.44	1.09	20	150.6
Wellington ..	415	56.2	+ 0.5	70.9	39.2	3.61	15	+ 0.07	1.67	20	171.3
Nelson	24	57.2	+ 0.8	73.0	35.2	3.34	8	+ 0.30	1.18	22	194.2
Waterlea	12	55.7	— 1.1	80.1	31.1	1.96	10	+ 0.18	0.46	22	173.8
Hokitika	12	52.9	— 0.3	71.9	31.3	7.01	13	— 2.38	2.45	22	131.9
Hanmer Springs ..	1225	49.9	— 2.1	74.8	24.5	2.48	11	— 0.85	1.12	22	142.1
Christchurch ..	22	53.6	+ 0.1	72.9	30.1	1.97	16	+ 0.13	0.40	7	132.4
Ashburton	323	52.1	— 0.3	70.8	30.0	2.02	10	— 0.28	0.72	23	146.6
Timaru	56	53.0	— 0.2	74.8	32.2	1.11	8	— 0.50	0.43	23	126.1
Alexandra	520	50.4	— 1.1	72.7	28.6	0.82	6	— 0.71	0.24	5	161.0
Taieri	80	50.6	— 0.7	72.8	28.8	1.94	12	— 0.45	0.64	6	
Invercargill ..	32	47.7	— 1.3	70.0	33.0	2.76	15	— 1.41	0.57	6	



Winter Feeding of Stock in Southland

FAILURE to maintain the condition of stock during late winter and early spring causes not only losses of stock in Southland but also lower production of milk from dairy herds and failure of ewes to rear their lambs to the best advantage. This article by G. A. Thomson, Veterinarian, Invercargill, and W. L. Harbord, Fields Instructor, Invercargill, purports not to lay down hard-and-fast rules about winter feeding but to emphasise that better feeding is possible and desirable.

SOUTHLAND Province consists of the four counties of Southland, Wallace, Fiord, and Stewart Island, but the last-named two are mainly bush-covered, mountainous country, so that only Southland and Wallace Counties make any real contribution to the agricultural production of the province. Southland County has more than 2,000,000 acres of occupied land and Wallace County 1,200,000 acres. The northern parts of both counties consist mainly of high tussock country; the remainder is mainly flat or slightly-rolling land not very far above sea level, and on these areas most of the livestock of the province are concentrated. The province carries 150,000 cattle (including 50,000 cows in milk) and 2¼ million breeding ewes, from which more than 100 per cent. of lambs are tailed.

Growth of Pastures

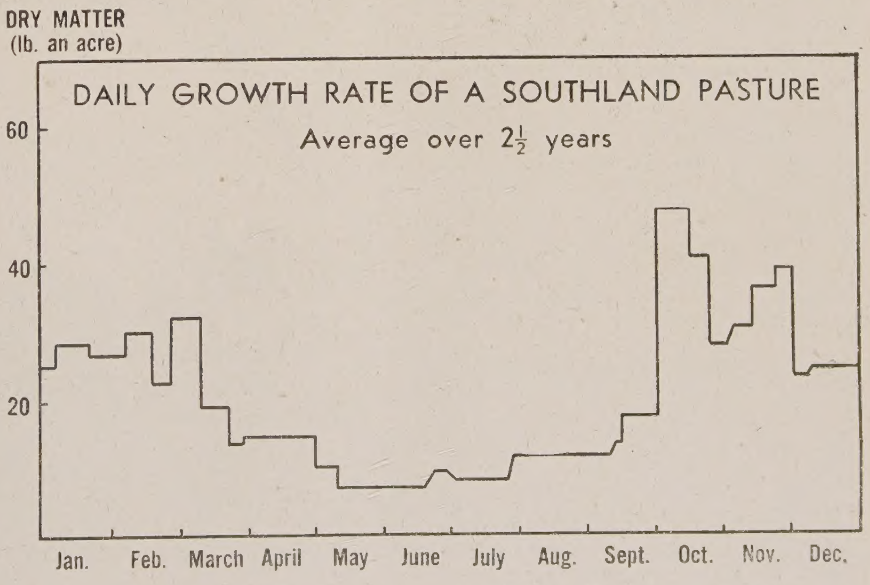
Because of its geographical position, Southland has a longer period of minimum pasture growth than areas further north. There is also a possibility each year of lack of feed for a short period in summer because of hot, dry weather, but that is not such a problem as in northern districts. The average annual rainfall for Invercargill is about 45in. and that of Centre Bush, a district 30 miles north of Invercargill, is about 33in.

As the graph on this page shows, the period of minimum growth usually begins in May. During that month and early June sufficient accumulated pasture feed may be available on the farm, but supplementary feeding is essential from mid-June until late September if stock are to be maintained in condition. During August there may be a slight flush, but not enough to provide more than a bite or two of fresh grass for the stock. Not until late September or early October does the real flush begin, and feed is not adequate before mid-October.

Dairy cows in factory herds usually calve between late August and mid-September, and lambing begins on the average about the second or third week in September. Thus both calving and lambing periods precede the average period of flush of feed.

Failure to provide adequate supplementary feed in July and August leads to the occurrence of red water in cattle and pregnancy toxaemia in ewes, and in Southland hundreds of cattle and thousands of ewes are affected in those ways each year, showing that the standard of feeding can be much improved.

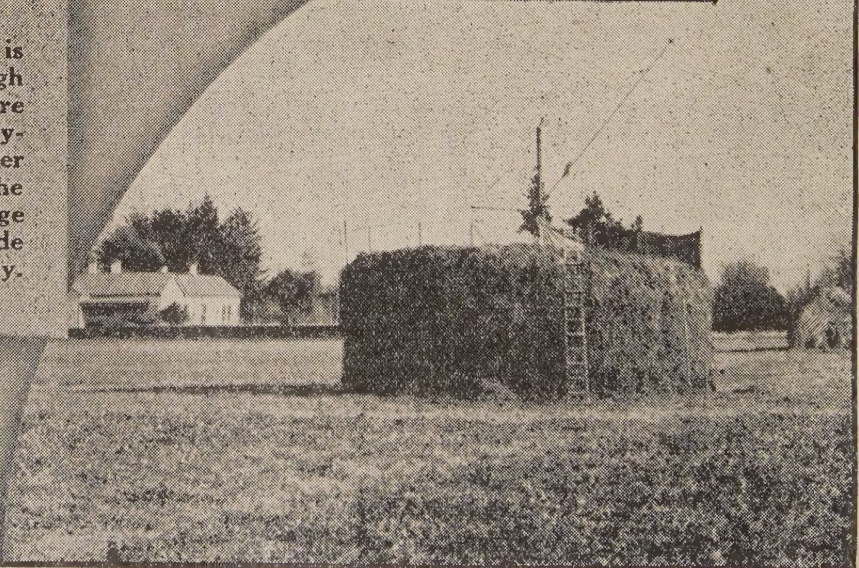
There is no doubt that failure to maintain the condition of stock during the late winter and early spring causes not only losses of stock but also lower production of milk from dairy cows and failure of ewes to rear their lambs to the best advantage. That has been clearly shown by the noted English scientist John Hammond, who has stated that the size and strength of a lamb at birth can be affected considerably by the state of nutrition of the ewe during the second half of



WINTER FEEDING OF STOCK IN SOUTHLAND

Left—Portion of a field of chou moellier in Southland. Such a crop helps to tide stock over the late winter and spring. Below—Sheep grazing on a chou moellier crop in snowclad country

Surprisingly little silage is made in Southland, though the weather is often more suitable for it than for haymaking. Good silage is better than poor or rotten hay. The stack of red clover silage shown on the right was made at Lochiel, Southland County.



pregnancy. Extra food supplied during this period causes increased growth not only of the lamb before birth but also of the udder of the ewe, so that more milk is secreted after parturition and the lamb grows much more quickly after birth. For example, twin ram lambs have been found to weigh 67lb. at 13 weeks old where the ewes were well fed during the second half of pregnancy, compared with only 39lb. at 13 weeks old when the ewes were not so well fed.

On many farms in Southland concern is felt because lambs do not do as well as they are expected to, and very often it is considered that a mineral deficiency of some kind must account for it. It may be reasonable to wonder whether the feeding of the ewes during the latter part of pregnancy is at fault. The most common practice in Southland is to rely on turnips, swedes, and chou moellier, with the addition of such hay as is available. Other crop feeds are used in smaller quantities, as shown in the following table, and a certain amount of chaff and concentrates is fed out.

Hay, Green Fodder, and Root Crops grown in Southland, 1945-46 Season

	Acres
Grasses and clovers cut for hay	26,923
Grasses and clovers cut for silage	182
Lucerne cut for hay or silage ..	109
Oats for chaff	16,029
Rape	12,632
Kale (including chou moellier)	12,379
Other green fodder	773
Swedes	59,761
Turnips	29,572
Turnips and rape	18,584
Mangolds	395

Hay

The first point of interest is the relatively-small area cut for hay, and the extremely small area cut for silage. If the 1362 holdings smaller than 50 acres are disregarded, the 4462 larger holdings cut an average of only six acres of hay yearly. Southland hay crops are not remarkably heavy, nor is the average quality very high. Very often the weather is such that crops are partially spoiled by rain and weathering before harvesting is completed. There is a tendency also to allow hay crops to become too mature before being cut, so that the crop contains a high proportion of indigestible fibre.

Earlier cutting and the utmost endeavour to stack or bale at the correct time can do much to increase the nutritive value and palatability of Southland hay crops. Much of the hay baled in the province ultimately proves of a quality far below that expected.

Too often hay is baled when it is not sufficiently seasoned or too damp, and such hay frequently can be classed as bad silage. Much hay that is baled would probably prove of better quality when used if it had been stored in the stack rather than in the bale.

It is considered that the Southland farmer could do much good if more use were made of special-purpose crops for hay, such as Italian ryegrass and red clover. Larger areas set aside for hay crops would result in fewer shortages in the winter. There should never be any necessity to ration hay.

Silage

Though both the making and feeding out of silage entail more labour than the corresponding operations with hay, it is surprising that so little silage is made in Southland, where the weather is often more suitable for it than for haymaking. Good silage is always better than poor or rotten hay.

Lucerne

Many years ago attempts were made to grow lucerne in Southland, but few stands were successful, possibly because of lack of knowledge of the many factors needing consideration—suitable ground and its proper preparation, heavy liming, time of sowing, control of weed growth, and the use of "lucerne culture." As a result, the opinion is commonly expressed that lucerne cannot be grown successfully in Southland.

That this opinion is not entirely correct is shown by the gradually-increasing though still small acreage devoted to lucerne (1943 30 acres, 1946 109 acres, 1947 130 to 140 acres) and by the results obtained by individual farmers. Possibly this success is the result of a greater understanding of the use and application of a culture of the necessary soil bacteria. Today such culture is supplied ready for mixing with the seed just before sowing, which is a much better method than the old one of topdressing the area with soil from an old lucerne stand.

One farmer in the Wyndham district who sowed a stand of not quite 11 acres in January, 1940, cut 5602 bales in four seasons (1944-47), an average of 1400 bales a season or 127 bales an acre.

Another farmer in the same district, with a more recently-sown stand, cropped about 1050 bales from a six-acre paddock in the 1946-47 season. With a favourable spring this season his stand yielded a first cut of 651 bales on November 15, a second cut of 402 bales in early January, and with a third cut in March the total for the season should be about 1350 bales—225 bales an acre for the season. Counting 30 bales to the ton, that gives a total of between seven and eight tons an acre of the finest hay.

Several other farmers in the Wyndham district have been sufficiently impressed to grow lucerne themselves, and other small stands are appearing in the Waikaka district. There must be many more farms in Southland capable of growing this excellent crop, of which Morrison in the standard text book "Feeds and Feeding" says: "Alfalfa (lucerne) heads the list of all common hay crops and is commonly taken as the ideal with which other hay is compared. The excellence of alfalfa hay is due to its high yield, its palatability, its richness in protein, its unusually-high content of calcium, and its value as a source of vitamins A and D. Alfalfa provides more than twice as much digestible protein per acre as clover hay and about five times as much as hay from timothy and mixed timothy and clover."

Chou Moellier and Kale

A considerable area of chou moellier is grown each year for feeding to sheep and cattle. Average crops are not as heavy as are obtained in the north but serve a useful purpose in helping to tide the stock over late winter and spring. However, chou moellier does not provide a balanced diet; it has a high water content and is low in protein, and stock fed too long on it are likely to develop red water. Once second growth begins in the spring chou moellier is often a dangerous feed, being thought to cause occasional abortion in both sheep and cattle. It should always be fed in conjunction with some form of supplement—for example, hay or concentrates.

Another crop worth consideration, and one which could readily be put to good use for winter greenfeed, is kale. This sheep feed has a fairly good nutritional value and is a splendid holding crop—so much so that it could be used for greenfeed when all the turnips and swedes have been eaten. As with chou moellier, however, the diet should always be balanced in some way with hay or concentrates.

Swedes and Turnips

Southland is noted for the excellent crops of roots which it grows. As a result, a good paddock of turnips or swedes, in conjunction with a bare pasture run-off paddock, is often considered sufficient for the stock. That it is not really sufficient can be seen readily in the spring, when many herds and flocks are in undesirably-poor condition.

These roots, while undoubtedly of great value in providing a portion of the winter diet, contain only about 10 per cent. of dry, nutritive matter, the rest being water, and it is often forgotten that, particularly in wet winter conditions, many bulbs of the crop are buried beneath the mud to such an extent that they are lost to the stock.

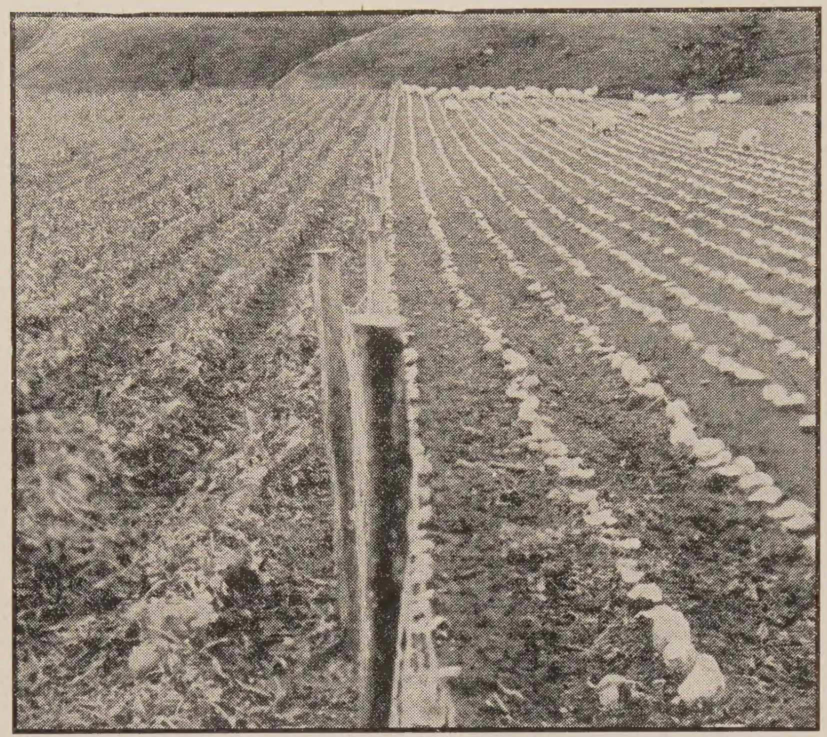
Theoretically, a ewe of 150lb. live weight would need to eat about 23lb. of swedes daily to maintain its weight if no other feed were available. At that rate 1000 similar ewes require 10 tons of swedes a day, so that 20 acres yielding 30 tons of eatable swedes an acre should maintain 1000 ewes for two months. The trouble is that sheep usually will not eat enough to maintain their condition. An experiment carried out last winter on the Winton Experimental Farm demonstrated that point. A group of ewes were weighed on to a bare paddock and fed weighed quantities of clean, freshly-pulled swedes in excess of their requirements. After two weeks they had lost an average of 4¼lb. in weight. During the first week the average daily consumption of swedes was 13¾lb. and during the second week 12¾lb., compared with the daily requirement for sheep of their weight of about 21lb.

In other words, because of the watery, unbalanced nature of a diet of swedes or turnips, stock will not eat enough over a long period to maintain their condition. Additional feed must be given to vary the diet and help balance the ration.

Saved Pasture

By shutting up the ewe flock in the autumn in as few paddocks as possible

WINTER FEEDING OF SOUTHLAND STOCK



Sheep grazing swedes. Such a paddock of roots, in conjunction with a bare pasture run-off paddock, is often considered sufficient for stock, but their poor condition in the spring shows that it is not.

the farmer can achieve two objects: A reduction in the condition of the ewes at a time when it is harmless or even beneficial to the animals, and a saving of the grass growth in unstocked paddocks so that it can be fed off in winter; this grass, despite weathering, provides a valuable addition to the winter ration.

A paddock which goes into the winter bare of grass cover, or one which is grazed to any extent during the winter, is always slow to produce spring growth. If not winter grazed, paddocks approaching the winter with 3in. of growth on them will, despite severe winter frosts, provide a welcome early and clean feed during the period between the last of the swedes and the time when spring grass growth is sufficient to maintain a ewe with lamb at foot.

Judicious topdressing with lime, phosphate, or both plays an important part in achieving early-spring grass growth. Many farmers prefer to topdress pastures during the autumn, which is sound if the operation is carried out during the early autumn. Autumn topdressing applied not later than March and preferably during February will usually give good results in early-spring growth. Such results cannot be expected when autumn topdressings are applied later than March.

Green Crops

All farmers know the value of greenfeed during late winter and early spring, but too few use it as a regular addition to winter feeding. Ryecorn, black barley, green oats, and Italian ryegrass are all valuable as an addition to the usual root-crop diet.

Ryecorn is particularly useful for this purpose, giving good bulk and a quick recovery after grazing. Grazed carefully, it is not uncommon for two or more grazings to be taken from each break of the crop. Farmers in the Otautau and Aparima districts sometimes sow ryecorn during late December to obtain a fattening crop for weaned lambs. This crop later supplies useful late-winter or early-spring greenfeed. Ryecorn grown for winter feed can also prove profitable when it is saved and allowed to produce a crop of grain. Perhaps one reason for this crop's lack of popularity is the poor crops sometimes grown because of the use of a line of low-germinating seed. Ryecorn loses germination rapidly if not stored under good conditions, and therefore it pays to sow seed of a known germination figure or a line recently harvested.

Black barley gives a crop of good bulk but does not have such good recovery powers as ryecorn. Many farmers who have sown ryecorn and black barley on separate portions of a paddock profess to have had better results from the ryecorn.

Dun oats are preferred for green oats for winter and early-spring feed. This oat stools better than most varieties but is not in very plentiful supply at present. It recovers better after grazing than do most other varieties.

Italian ryegrass sown during late summer or autumn is another very useful winter and early-spring greenfeed for stock. It produces a considerable bulk of feed, and some farmers each year have an area of this crop, which is later harvested for seed or sometimes for hay, particularly when sown with red clover.

Short-rotation ryegrass: Another very useful plant to supply winter feed supplementary to roots is the comparatively-new short-rotation ryegrass. A 12-acre trial area sown on December 29, 1944, at the rate of 30lb. of short-rotation ryegrass, 3lb. of Montgomery red clover, and 2lb. of white clover an acre carried 500 ewes during August, 1945, for the first 14 days for two to three hours a day and for the remainder of the month for 24 hours a day, with no supplementary feed. This splendid record was achieved after the area had fed 100 weaned lambs from March 1 to March 14 and then 150 lambs until April 16, followed by 20 rams from June 6 to July 25, when 200 ewes were added to the stock already grazing the area; these sheep were removed on August 1. Such a record surely proves the value of short-rotation ryegrass. The pasture concerned is still flourishing and is now in its fourth year. If an area of this grass was fed in breaks, the need for roots would not be so great and the stock undoubtedly would be healthier. Sown on suitable land where drainage is fairly good, and treated liberally with lime, this grass must gain popularity with the Southland farmer.

Chaff and Concentrates

Oaten chaff is a useful feed and is used frequently as an alternative or an addition to hay. However, the straw has little feeding value—it is the oat content which gives chaff its worth. Oats added to the chaff can easily double its value.

Chaff made from different varieties of oats has very different feeding values. Varieties with a fine straw, such as Dun or Resistance, produce a better chaff than that from such coarse-strawed varieties as Onward.

Chaff has a big advantage over hay in that it can more easily be mixed with concentrates such as peas, meat meal, linseed, or any proprietary stock food, judicious use of which makes keeping the stock in the desired condition much easier.

Better Feeding Possible

Obviously, better feeding is possible and desirable. For farmers who desire to devise rations balanced accurately for any particular class of stock books are available which show the necessary calculations and tables. The average farmer is more interested in the general management of his flock or herd as a whole. If he can keep his stock in good condition, his production at a high level, and his losses from malnutrition and associated diseases at a minimum, he is satisfied. However, if he loses cattle with red water or ewes from pregnancy toxaemia, or if his butterfat or fat lamb production remains low despite apparently-good conditions throughout the production season, he should examine his winter feeding methods and see whether improvements are obviously and urgently required.

◆

QUALITY OF N.Z. BACONER PIGS PRAISED BY ENGLISH JUDGES

AT the conclusion of the North Island pig carcass competition sponsored by W. and R. Fletcher (N.Z.) Ltd. last year 200 of the carcasses entered, including the main prizewinners, were sent to London to be reported on at Smithfield by specialists in the United Kingdom trade. The report made by these specialists, Dr. J. Hammond and Messrs. J. B. Swain and H. R. Davidson, is set out in this article by C. P. McMeekan, Superintendent, Animal Research Station, Ruakura, and A. Longwill, Assistant Superintendent of the Pig Industry, Wellington, who discuss the main points raised in the report.

The Smithfield judges. From left: Messrs. J. B. Swain and H. R. Davidson. Dr. J. Hammond is standing on the right.

THE report states: "We inspected 100 baconer carcasses and 100 porker carcasses displayed at Smithfield market on January 13, 1948. Detailed examination of the prizewinning carcasses was made and representative carcasses were cut and measured.

"The outstanding general impressions gained were of the high and level quality of the baconer pigs and of the change in weight and type of the porkers which are now being sent over. The pork pigs are definitely heavier in weight than before the war, and they are from pigs of later-maturing type than formerly, many of the best actually being from purebred Large Whites.

"It would appear that this change may be linked with an attempt to play for safety in case the relative positions of the pork and bacon market should change, and we wonder if something may not be lost if the early-maturing Berkshire and Tamworth type of pig is not used more to make use of the milk residues and good climatic conditions of New Zealand.

"Individual baconer carcasses ranged from 127 to 169lb., with a range of 42lb. at an average weight of 144lb. (146lb. last year). Porker carcasses ranged from 70 to 106lb., with a range of 36lb. at an average weight of 84lb. (88lb. last year).

"The change in type of porker carcasses shows most in the hams. In the bacon pigs a type of Large White is being used which is evidently very well adapted for the purpose.

"In the cutting of carcasses much the same procedure was followed as last year. We selected in this case the groups with the highest and the lowest total marks in New Zealand, with the exception that as group 418 in the porkers had been subject to a certain amount of pressure in storage and the carcasses were accordingly somewhat out of shape, we selected number 410 instead."

A comparison of marks awarded under the New Zealand method and the Smithfield method, as was prepared last year, is set out in the tables on page 427.

Comparison of Judging Systems

The comments in the report on the comparison of the New Zealand and Smithfield systems of judging are as follows:—

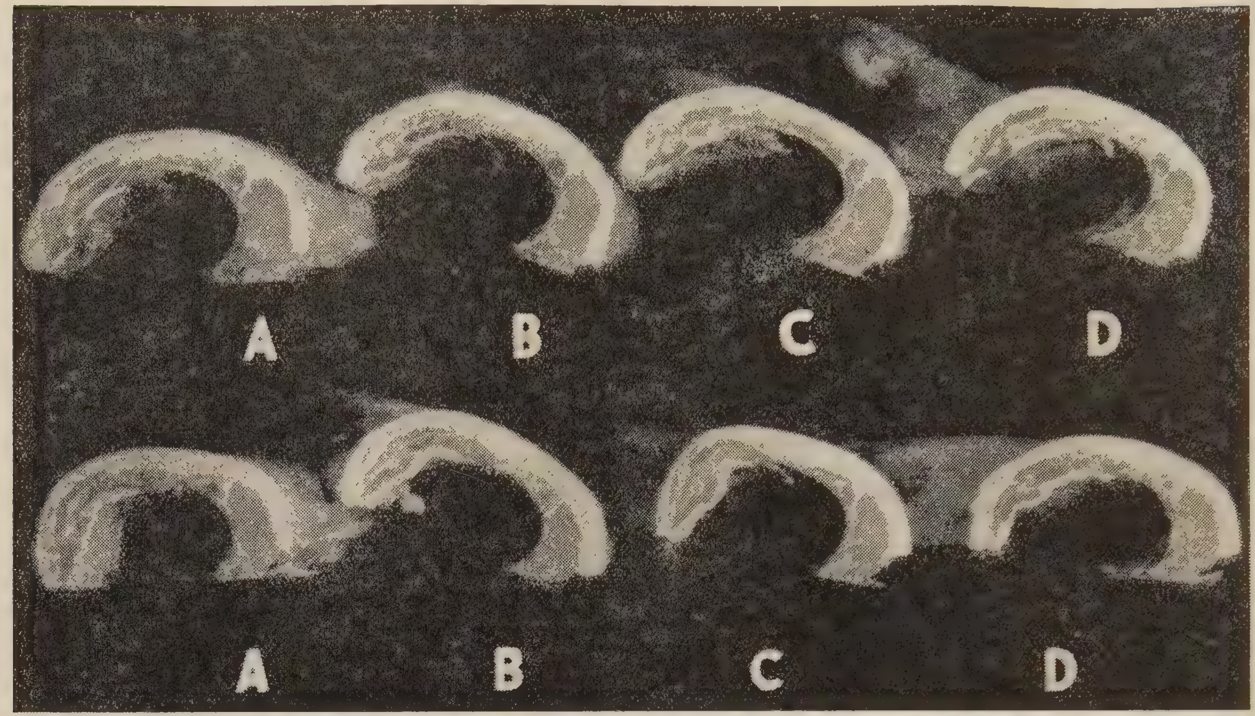
"It will be seen that on the whole these results confirm those obtained last year. Appraisal of the loin by eye from external observation cannot be more than the 'educated guess' claimed for it, and this year the actual measurements we were able to take showed that the eye estimates gave widely-varying results, particularly in the two lower-mark groups (groups 16 and 410). For example, in group 16 the New Zealand marks amounted to 8 for each of the four carcasses, while marks based on measurement varied from 1 to 14 in the same four.

"As a result of this examination we would offer the suggestion that in the New Zealand method of judging, which gives very good results in encouraging and maintaining a high general level of carcass quality, the expression 'fullness of meat' might be dropped in exchange for 'width and depth of loin,' which is, in fact, what is being observed in eye appraisal. The determination of fullness of meat for detailed competition or breed assessment purposes is best done by measurements on the cut carcass."

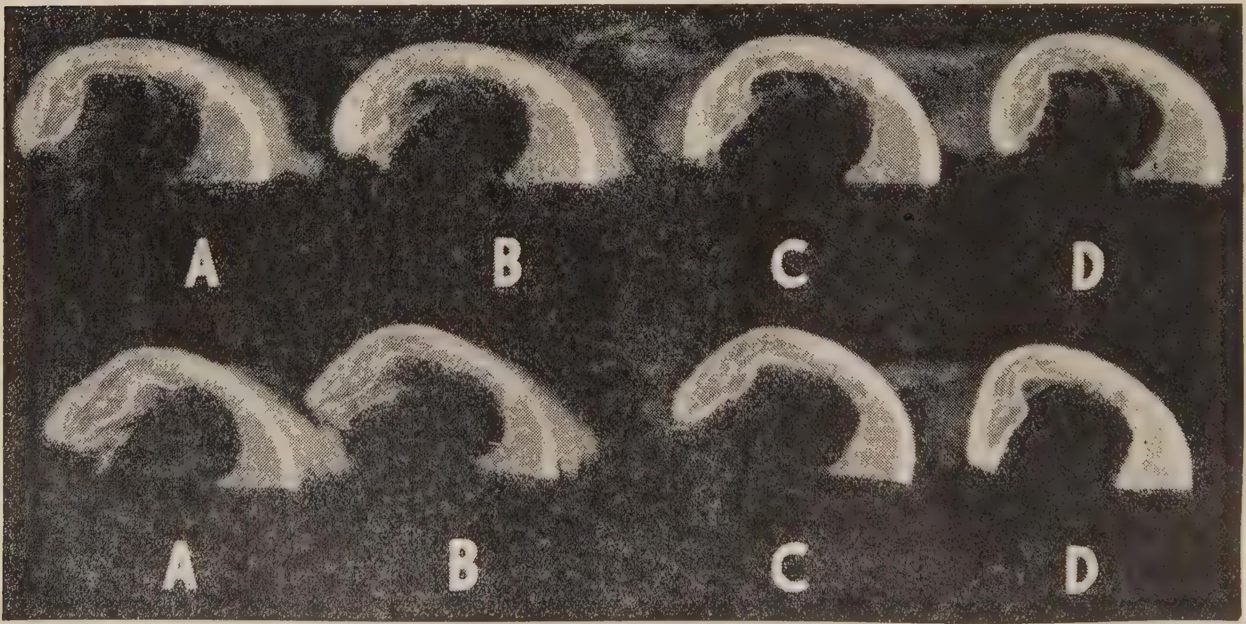
In view of the consideration that must be given to the opinions of such specialists, it is important to understand the background of both the Smithfield system of judging, on which the overseas opinions are based, and the New Zealand system.

The Smithfield system is based on cutting the carcass through the middle of the most valuable part and at a point which considerably reduces the sale value of the resulting pieces. Of the total points awarded 60 per cent. are then given for measurement of the muscle and fat on this cut surface, which is in the loin region. The

CUT SIDES OF PRIZEWINNING BACONERS AND PORKERS



Upper—Sides of the four pigs of group 160, the champion baconer group and winner of the first prize in the Northland district. They were considered to require slightly more finish. Lower—Group 16, winner of second prize in the Tairawhiti district. Though not as good in eye of meat as group 160, these were considered by the Smithfield judges to have a more desirable finish. A and C are practically ideal, B slightly overfat, and D slightly underfat.



Upper—Group 219, champion porker group and winner of the first prize in the Northland district. Apart from A, which is a little overfat, these pigs have practically the ideal finish for their weight according to Smithfield standards. They are excellent for fullness of meat in the loin. Lower—Group 410 (purebred Large White), winner of first prize in the Tairawhiti district. These pigs with the exception of A, which is slightly too fat according to Smithfield standards, lose one or two points through being very slightly under-finished. Eye of meat, particularly in A and B, is deficient.

COMPARISON OF SMITHFIELD AND NEW ZEALAND MARKS

Baconers

Group	lb.	Loin			Backfat		
		Depth mm.	Smithfield marks	N.Z. marks	Thickness mm.	Smithfield marks	N.Z. marks
160			(28)	(10)		(20)	(20)
A	163	40	13	7	17	15*	18*
B	161	40	13	8	16	14*	16*
C	158	41	15	7	15	14*	14*
D	150	39	13	7	14	12*	18*
Total ..			54 (112)	29 (40)		55 (80)	66 (80)
16							
A	137	33	3	8	20	19†	9†
B	142	31	1	8	23	17†	9†
C	141	39	13	8	20	20	16†
D	148	40	14	8	18	18*	20
Total ..			31 (112)	32 (40)		74 (80)	54 (80)

Possible marks are shown in parentheses.

* Indicates that points were lost through insufficient finish.

† Indicates that points were lost because the pig was overfat on the standards of the particular system.

Porkers

Group	lb.	Loin			Backfat		
		Depth mm.	Smithfield marks	N.Z. marks	Thickness mm.	Smithfield marks	N.Z. marks
219			(28)	(10)		(20)	(15)
A	94	36	14	7	15	16*	11†
B	92	38	16	8	11	19†	11†
C	95	36	14	7	12	20	15
D	92	41	19	7	12	20	11†
Total ..			63 (112)	29 (40)		75 (80)	48 (60)
410							
A	86	28	1	6	12	19*	13†
B	83	28	3	5	9	18†	11†
C	90	36	14	6	11	19†	11†
D	81	31	9	6	10	19†	9†
Total ..			27 (112)	23 (40)		75 (80)	44 (60)

Possible marks are shown in parentheses.

* Indicates that the pig lost points for backfat through being overfat.

† Indicates that the pig was under-finished according to the standards of the particular system.

system recognises a fact that is indisputable—that an exact appraisal of the cutting value of a pork and bacon side cannot be made without cutting. Unfortunately, though such a system is the ideal, it is an ideal that is unattainable, because neither in Britain nor in New Zealand will commercial houses handling pig meats permit cutting of a large number of pigs in the loin because of the economic loss involved.

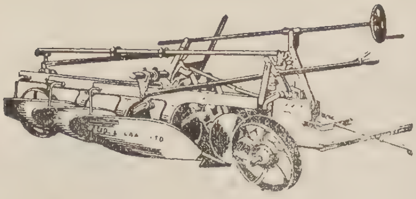
The New Zealand system of judging faces up to this problem, and is aimed at providing the maximum essential information about a carcass that can be obtained without destroying its sale value. As about 4000 pigs a year alone are involved in the judging of the competition sponsored by W. and R. Fletcher (N.Z.) Ltd., the importance of this factor will be appreciated. The New Zealand system recognises that it must fail in placing carcasses in order of merit for eye-muscle development. It is clearly impossible to assess (to within the 2 or 3 millimetres accuracy necessary) the precise thickness of the eye muscle when it is invisible in the uncut carcass. The Department of Agriculture Bulletin No. 243, "New Bacon-judging Standards," which outlines the New Zealand system, deals with the methods adopted for obviating this shortcoming. The only claim made for the system is that it is capable of sorting out the type of baconer required by the English Wiltshire trade and is not capable of assessing the differences in eye-muscle thickness demanded for more precise carcass-evaluation work. It is pleasing to note that the English authorities concur with this view and for the last three years have reported on each occasion that this objective has been attained. Quite rightly, however, they have criticised the term fullness of meat, in that this implies that eye-muscle depth can be judged by eye.

Importance of Eye-muscle Depth

In any event the New Zealand workers are not in complete agreement with the English authorities regarding the importance attached to eye-muscle depth. Work carried out by the chairman of the New Zealand Bacon Standards Committee while he was at Cambridge with Dr. Hammond showed that eye-muscle depth was not a good measure of the muscle development of a bacon or pork pig, and therefore one of the main arguments for awarding 28 marks of the total under the Smithfield system for this character was discounted. The only argument left to support such emphasis on this measure is the undoubted part which thickness of eye plays in affecting the appearance of the rasher of bacon and therefore its appeal to the prospective purchaser when displayed in the shops. For these reasons, together with the impossibility of cutting, the New Zealand system completely eliminates all marks for eye muscle and substitutes for the 28 points in the Smithfield system 10 points for loin development. It is unfortunate that originally a psychological mistake was made in calling this character fullness of meat. This mistake was rectified nearly two years ago when the bacon standards committee decided in view of the apparent misconception in the minds of the English judges to rename the character "development of loin." The accompanying illustrations show that though some carcasses fail a little in depth of eye, the proportion of muscle in the cut sides is very good. No carcass could be condemned as deficient in muscle development, and the illustrations of all the sides cut in England show that the New Zealand system has picked out very meaty pigs.

It is notable that the standard set under the Smithfield system for thickness of eye muscle is an exceptionally high one. The strictness of the standard is indicated by the fact that under that system the pigs of group 160 scored only 49 per cent. of the possible and those of group 16 only 28 per cent. of the possible. It may even be questioned whether a baconer scoring more than 60 per cent. of the possible under that system would produce as desirable bacon as those of group 160. A large eye of meat in the bacon rasher with only a light fat covering increases the risk of "burnt offerings" for breakfast.

In porkers there is not the same weight for the argument against over-emphasis on eye-muscle development. It is virtually impossible to get a pork carcass too full of meat. Few people, however, would wish for better-proportioned pork than pigs B and D of group 219. These pigs have almost



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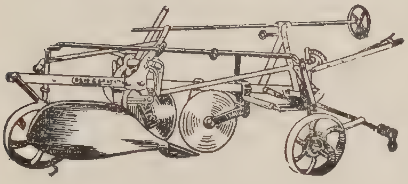

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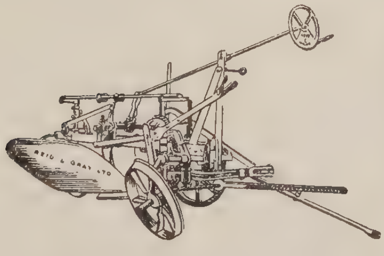

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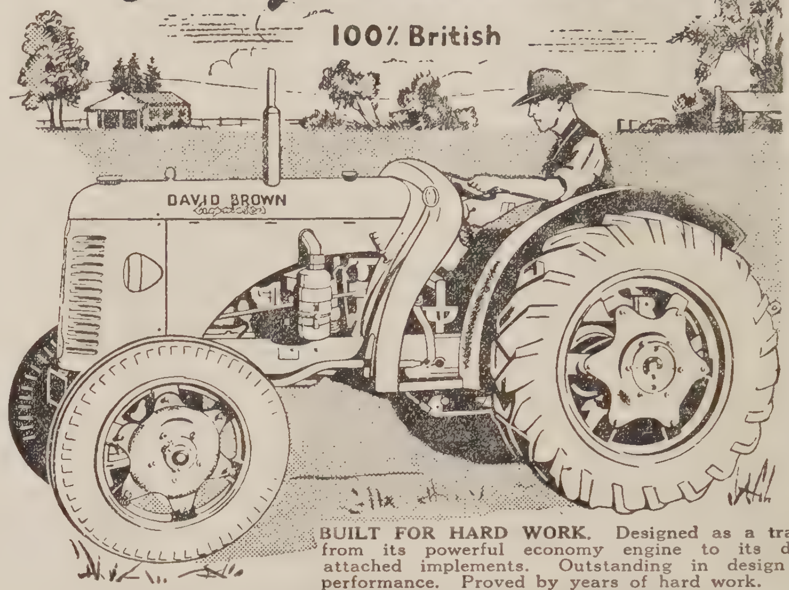

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ideal backfat cover according to Smithfield standards, yet score only 57 per cent. and 68 per cent. of the possible points for eye of meat.

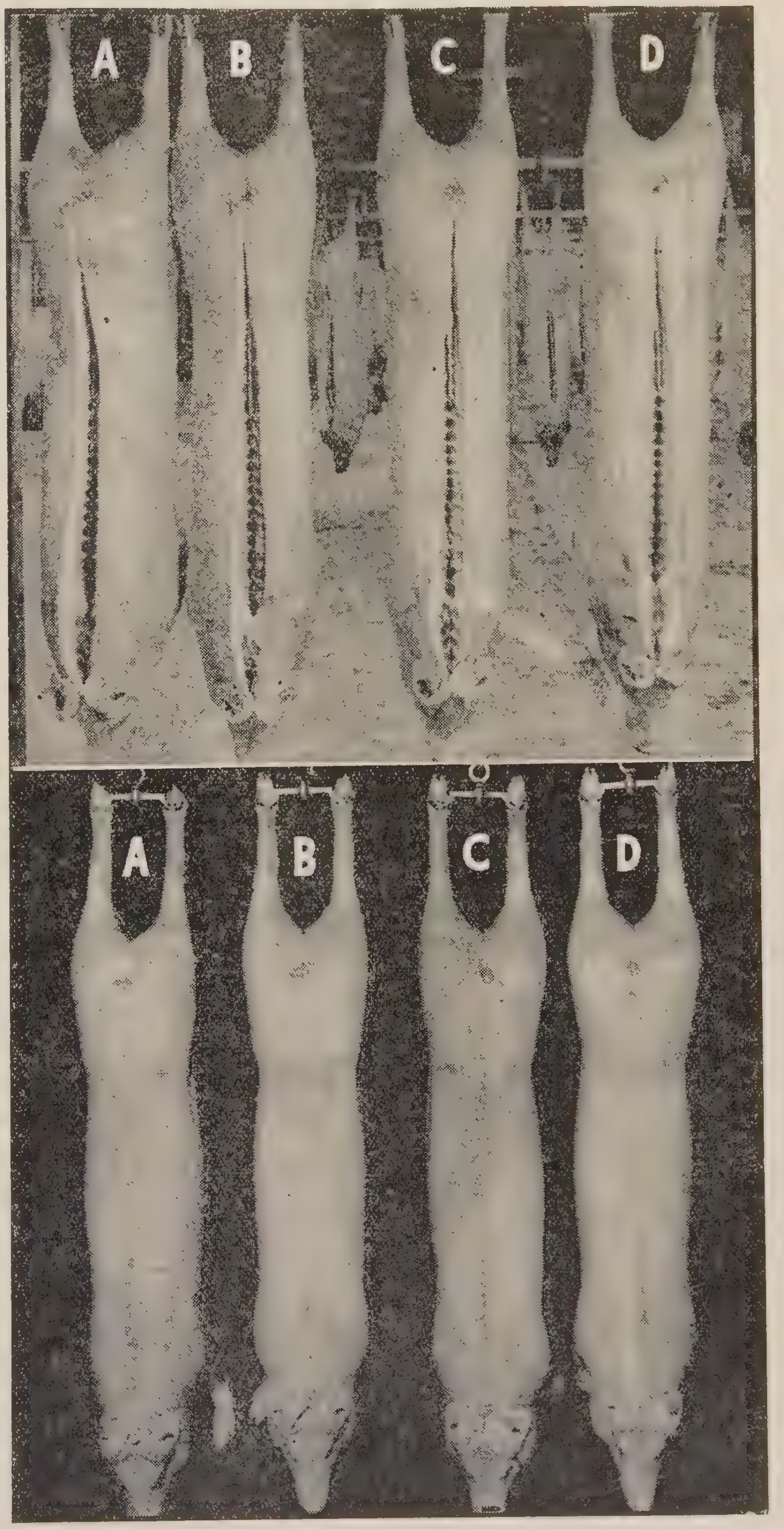
Backfat at Loin

Commenting on backfat at the loin, the Smithfield report says: "The estimation of backfat is less variable. Curiously enough the winning bacon group lost marks for fat, not because there was too much, but because there was too little. At an average weight of 158lb. this is rather remarkable. In this case clearly feeding and breeding have been very well adapted to one another."

The discrepancies in points awarded for backfat for two groups by the English judges and the New Zealand judges call for some comment. They are probably caused in part by alterations in fat cover that occur during freezing, transport, and handling through pressure altering the shape of the carcass. Reference to this is made by the English judges themselves. More important, however, is that the position of fat measurement is different in the two systems in the case of bacon and is taken in quite a different way in the case of pork. This situation results again from the refusal of commercial firms conducting these competitions to allow the New Zealand judges to cut the carcass. As a result backfat in baconers is judged in New Zealand on the backed-down carcass and gives a measure of fat in the centre line of the pig. In the Smithfield system the fat is measured at the point of the eye from 1 to 1½in. further down the side than the centre line. This measure can be made only on the cut pig. In porkers comparisons are more involved, as backfat has to be judged in New Zealand without even backing down. This is carried out by measuring the depth from the skin to the top of the vertebrae through a small slit at the required point. It is obvious that such a measure cannot be of very high accuracy. The accompanying illustrations show that the New Zealand measurements are greater than those taken under the Smithfield system for the same bacon side. This is taken into account in the points table for backfat at loin used in the New Zealand system.

Under the two systems of judging there must be discrepancies in points allocated to the same pig because of such factors of conformation as the shape of the eye and meat. However, the points allocated under the two systems, as shown in the table on page 427, show that in practice the standard of backfat is slightly more exacting under the New Zealand system

WINNING BACONER AND PORKER TEAMS



Upper right—The champion baconer group (group 160) of Large Whites, entered by Mr. J. B. Logan, Kamo, Whangarei, on hooks at Smithfield before being cured and before the sides were cut. Lower right—The champion porker group (group 219) of Large Whites, bred by Mr. N. A. Fraser, Kawa Kawa. Though slightly above the most desirable porker weights, they are excellent porkers and well balanced in every respect.

for baconers and more lenient for porkers than the Smithfield system. As New Zealand baconers tend to be too short and fat for their weight, it is necessary to set an exacting standard for competition purposes which will serve to separate those which are superior in this character from the entries which are only average. It must be emphasised that such criticism as is made of the New Zealand system is based on the claim that the ultimate judgment of bacon quality can be made only on the cut side, as is done in the Smithfield system. Under this system 60 per cent. of the points are awarded on the cut side, 20 per cent. for fat, 28 per cent. for eye of meat, and 12 per cent. for streak.

It is impracticable under New Zealand conditions to cut the sides, and the baconer-judging standards committee has been faced with the task of devising a system which will pick out the best baconers as far as can be judged at the carcass stage. That it is successful in this is indicated by the Smithfield judges' remark in the early part of the report on the high general level of quality of the prize-winning baconers. No effort will be spared to improve the system still further if research and experience prove this to be possible.

Because of the factors outlined in the foregoing no attempt is made to rationalise the differences in the comparison table forwarded by the English authorities. A further reason for this is that the English judges examined only 16 pigs out of a total of about 4000 entered in the competition. Presumably because of the trade loss which would be incurred, the English judges were able to cut only 16 pigs. These 16 pigs were selected on the basis of the highest and lowest scoring groups, but they have been compared only for eye-muscle development and backfat. Neither of these characters influenced these groups' placings in New Zealand, but characters such as length, hams, balance of side, etc., did.

Aim of Expert Report

It would appear that little useful purpose is served by continuing to forward competition pigs to Britain for examination under existing conditions. The aim of sending carcasses to Britain for expert report should be clearly understood and defined. If it is to determine the suitability (for the British market) of pigs classified in New Zealand as of high merit, the system of judging used in Britain should be that used commercially in Britain or at most that employed in pig-improvement work there. If the object is to determine the efficiency of the New Zealand judging system as a carcass-evaluation system, a complete examination of all carcasses must be made, and the placings of the English judges of all carcasses should be reported back to New Zealand for comparison with those awarded under the New Zealand system. It is clear that the present methods are informative on neither count.

New Zealand pigs on the whole fail in length, balance of side (heavy fore-end), hams, and in degree of finish more than in fullness of meat, and much can be done to improve them in these respects with the help of the present judging standards, which mainly cover these points as they can be judged in the carcass. Furthermore, in judging groups of pigs emphasis is placed on uniformity and suitability of weight for normal market requirements. These are all points of immediate practical importance.

The comment in the report that there is a change in the type of porker and the question raised as to whether this is a change in the right direction require careful thought. The reduction in pig population in recent years has been accompanied by an increase in average weight of both porkers and baconers slaughtered. This has increased the emphasis on the later-maturing baconer type of pig, and as New Zealand feed conditions largely dictate that porkers and baconers must be produced from the same breeding stock, producers will have to ensure that none of the desirable qualities of porkers, particularly hams and fullness of meat, is lost.

However, the system which picked out group 219 as champion porkers has much to commend it, and provided continuous study is given to the system, only good can come from its use. The criticism and suggestions of the Smithfield judges are appreciated as a great help in this respect.

Pig Broadcasts

UNDER the auspices of District Pig Councils broadcasts will be delivered in June as under:—

Auckland—1YA, on June 22, at 12.35 p.m., "Winter Farrowing will Mean Greater Pig Production," by H. Preston, Supervisor, Northland District Pig Council.

Napier—2YH, on June 11, at 7.15 p.m., "Litter Production," by H. Hopkins, Supervisor, Tairawhiti District Pig Council.

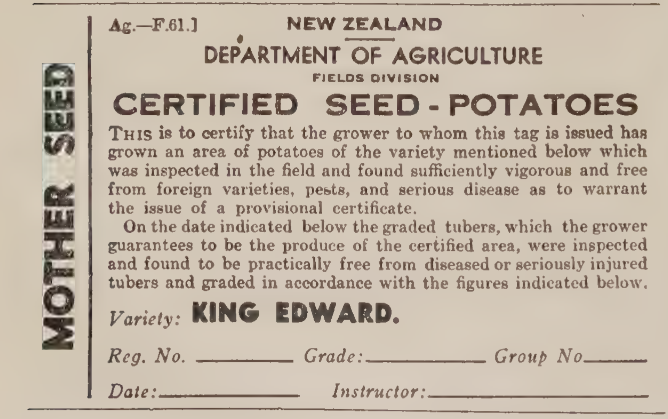
Palmerston North—2ZA, on June 18 at 7 p.m., "What Crops shall we Grow? A clear Plan Necessary," by L. L. Marsdon, Supervisor, Wellington District Pig Council.

Dunedin—4YA, on June 14, at 7.15 p.m., "Why this Wastage?" by N. Macdonald, Supervisor, Otago and Southland District Pig Council.

Seed Potato Certification

EXAMINATION of reports on field inspection of potato crops for seed certification in the 1947-48 season is now completed and information about crops which have been provisionally certified may be obtained from local offices of the Department of Agriculture.

The fact that a crop has been provisionally certified does not mean that the produce from it will automatically be regarded as Certified seed. The graded tubers must first be inspected by a Departmental officer to determine that the produce complies with the necessary standards of freedom from tuber-borne diseases and is in other respects also reasonably well graded.



MOTHER SEED

Ag.—F.61.] NEW ZEALAND

DEPARTMENT OF AGRICULTURE

FIELDS DIVISION

CERTIFIED SEED - POTATOES

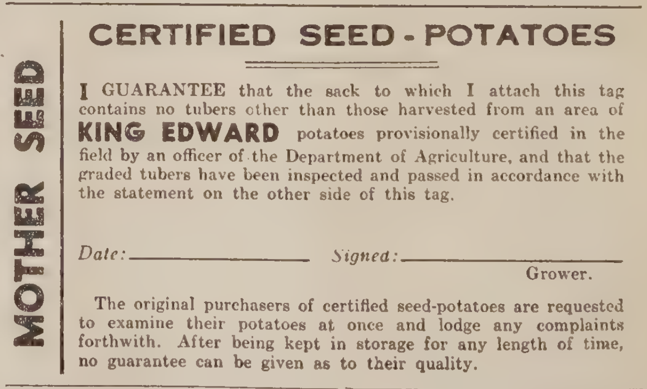
THIS is to certify that the grower to whom this tag is issued has grown an area of potatoes of the variety mentioned below which was inspected in the field and found sufficiently vigorous and free from foreign varieties, pests, and serious disease as to warrant the issue of a provisional certificate.

On the date indicated below the graded tubers, which the grower guarantees to be the produce of the certified area, were inspected and found to be practically free from diseased or seriously injured tubers and graded in accordance with the figures indicated below.

Variety: **KING EDWARD.**

Reg. No. ________ *Grade:* ________ *Group No* ________

Date: ________ *Instructor:* ________



MOTHER SEED

CERTIFIED SEED - POTATOES

I GUARANTEE that the sack to which I attach this tag contains no tubers other than those harvested from an area of **KING EDWARD** potatoes provisionally certified in the field by an officer of the Department of Agriculture, and that the graded tubers have been inspected and passed in accordance with the statement on the other side of this tag.

Date: ________ *Signed:* ________
Grower.

The original purchasers of certified seed-potatoes are requested to examine their potatoes at once and lodge any complaints forthwith. After being kept in storage for any length of time, no guarantee can be given as to their quality.

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SEED PRODUCTION IN NEW ZEALAND

Crested Dogstail

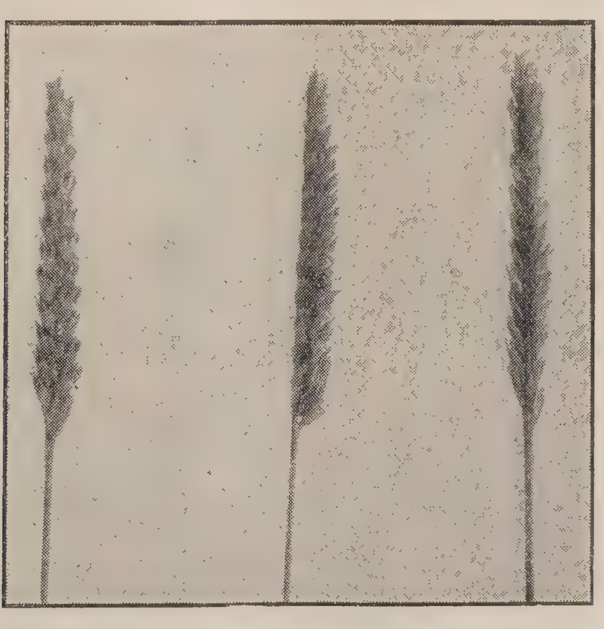
By A. STUART, *Assistant Fields Superintendent, Dunedin.*

CRESTED dogstail *(Cynosurus cristatus)* is adapted primarily to cool, moist regions. In Europe it is best known in England, Holland, and Switzerland; in New Zealand Southland is its principal stronghold. With the introduction to certification of the more permanent strains of perennial ryegrass, and with the increased topdressing of grassland, the use of crested dogstail seed for sowing in New Zealand has declined, but on hill country which suits it and on the lighter second-class soil types generally it is still a valuable constituent of the pasture sward.

THOUGH the plant is generally regarded as a perennial, it has been ascertained that the majority of the plants are annual or biennial in character. It owes its persistence in pastures mainly to its free seeding and to the fact that stock do not eat the seed head readily. It is essentially a bottom grass that can be smothered out easily by rank growth of other species. Crested dogstail owes its popularity to its earliness in spring and the high palatability of its leafage. In summer it runs rapidly to seed, and during that period little vegetative growth is produced.

The vegetative growth of crested dogstail is not readily distinguishable from that of perennial ryegrass, and in early spring most farmers give credit for this growth to perennial ryegrass until the seed head appears. The base of a crested dogstail plant removed from the soil is an unmistakable yellow colour, whereas the base of a perennial ryegrass plant, as in all ryegrasses, is distinctly reddish.

While Southland has been the chief producer of crested dogstail seed for many years, the amount harvested in Canterbury has increased markedly in recent years, in line with seed production generally in that district. Some years ago the Sandon district in the Manawatu also produced a fairly large quantity, but it has declined considerably in recent years.



Seed heads of crested dogstail.

Crested dogstail seed.

Special Seed Crops

In Southland, as elsewhere, only a small percentage of the area harvested is sown specially for seed production. Where that is the case it is usual to sow 20 to 25lb. of crested dogstail with 2 to 3lb. of white clover seed an acre. This mixture is usually sown broadcast in spring. The seed-bed must be fine and firm and the seed lightly covered by chain harrows, which are usually preceded and followed by a Cambridge roller.

After being grazed by sheep during the following autumn and early spring, the paddock is closed for seed production about mid-October and is usually ready for cutting toward the end of the following January. At the proper stage for cutting the seed is readily rubbed out of the head, the pales are yellow, and the caryopsis (known popularly as the seed but botanically as the fruit) has a leathery consistency.

Ordinary Seed Crops

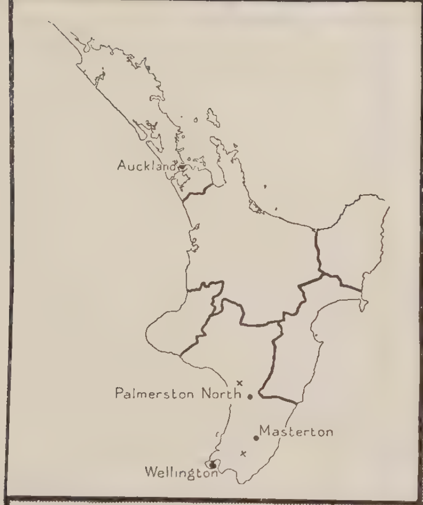
In most cases 2 to 3lb. of crested dogstail seed is included in the general seeds mixture of 40 to 50lb. of seed an acre. The paddock will probably be harvested in the first season for perennial ryegrass, and some years may elapse before a crested dogstail seed harvest is taken. Even then the area may not be specially closed for seed production, but more often in late January or early February it is stripped for seed if sufficient seed head is showing to justify the expense.

If closed specifically for seed production, the area can be handled more profitably by cutting it with the binder if that is possible, stooking for 10 to 14 days, and threshing out of stook. A header harvester moving between two lines of stooks is ideal for the threshing. The seed threshes easily. Occasionally the crop may be direct headed, but that necessitates later drying of the seed.

Stripped Seed

In general stripped seed lacks the golden canary-yellow of binder-cut seed which gives such an attractive appearance to the sample, and in comparison it is dark and lacking in brightness. With binder-cut crops an effort is usually made to secure in addition some seed of the old perennial ryegrass present in the sward, so the paddock is harvested slightly earlier than for stripped seed. Nevertheless, the dark-coloured seed, unless

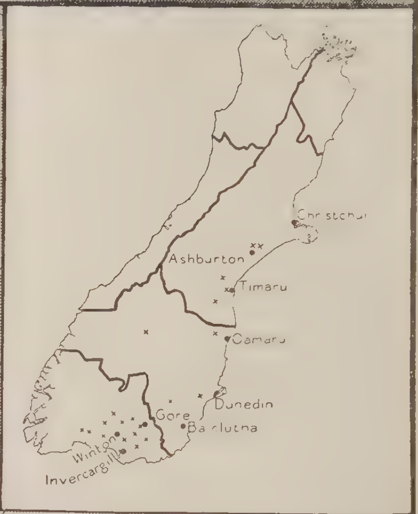
HARVESTING CRESTED DOGSTAIL SEED


Auckland
Palmerston North
Masterton
Wellington

Above — Crested dogstail in swath being picked up by a header harvester.

Areas where crested dogstail is harvested are shown by crosses on the maps.

Below — Seed from the stripper is loosely bagged and dried by being suspended over fence lines.


Christchu
Ashburton
Timaru
Oamaru
Dunedin
Gore
Balclutha
Winton
Invercargill

On much of the plains and rolling country of Otago and Southland crested dogstail is an important pasture plant.

it has become overheated after being stripped, normally has a higher germination than the brighter yellow seed.

Drying the Seed

To avoid overheating, stripped seed is often bagged very loosely, the bags being sown and then thrown over the top of a wire fence with half the seed hanging on each side. The bags are turned daily until the seed is thoroughly dry.

Another method employed frequently is to spread the seed in a thin layer on top of a cover placed over the grating in a woolshed, and this also involves turning the seed daily until it is dry.

Table 1: Average Annual Acreages Harvested for Five-yearly Periods

	1922-23 to 1926-27	1932-33 to 1936-37	1942-43 to 1946-47
Otago	429	492	1,030
Southland ..	3,961	2,893	5,284
Wellington ..	416	138	103
Canterbury ..	210	573	1,562
Rest of New Zealand ..	9	27	17
	5,025	4,123	7,996

The average seed yield is about 150lb. an acre. Yields of up to 350lb. an acre are occasionally obtained from special sowings, but areas stripped give much lighter yields.

Impurities

The most common impurities in crested dogstail seed are suckling clover, catsear, Yorkshire fog, sweet vernal, hairgrass, sorrel, and perennial ryegrass. Special seed crops naturally are the most free from impurity.

In ordinary seed crops Yorkshire fog is usually considered the worst impurity, particularly when the seed is small and becomes shelled. In that case the dressing loss may be severe, as separating the seed from the small dogstail seed in the line becomes almost impossible. The finished machine-dressed sample should have a purity of 97 per cent. and a germination in a good season of 90 per cent. or greater.

Export of Seed

As the quantity of seed produced in a normal season is far too great for New Zealand's requirements, an export trade has developed, the growth of which is shown in Table 2. The quantity exported frequently includes a carry-over from the previous year's production, which accounts for the fact that in some years the export figure exceeds that for production.

Crested dogstail in stook.

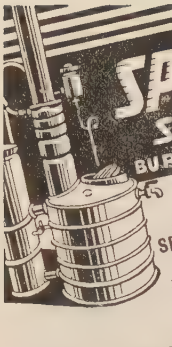
Table 2

Year		Quantity produced (cwt.)	Quantity exported (cwt.)	Value (£)
1927	..	13,252	5,434	35,978
1928	..	18,897	4,844	20,769
1929	..	11,400	4,363	16,429
1930	..	7,490	4,656	18,507
1931	..	5,140	3,180	10,209
1932	..	4,387	532	1,530
1933	..	6,327	3,472	9,114
1934	..	4,091	3,136	16,728
1935	..	4,990	1,307	8,465
1936	..	9,071	6,467	25,504
1937	..	6,428	735	2,736
1938	..	3,527	3,694	17,180
1939	..	5,774	947	5,385
1940	..	5,489	449	2,377
1941	..	5,708	3,285	13,869
1942	..	6,403	2,732	14,913
1943	..	3,978	4,203	29,953
1944	..	6,431	4,623	47,518
1945	..	11,676	8,848	95,407
1946	..	15,708	8,274	81,293

Great Britain is the principal importing country, but at various times seed has been exported to most European countries, including France, Denmark, Holland, Belgium, Sweden, Switzerland, Eire, and before 1933 Germany. In addition Australia, Canada, U.S.A., South Africa, and the Falkland Islands have bought seed. During 1946 the percentages of the total export which went to each country were: United Kingdom 72, Belgium 8, Sweden 7, Switzerland 4, Netherlands 3, Eire 3, Australia 2, and France 1.

Use in New Zealand

Crested dogstail is included in the general seeds mixture on most types of second-class country in New Zealand where the rainfall averages 30in. or more a year. As it is a bottom grass, it is more adapted for sheep country, where the sward can be managed under more or less continuous or set grazing conditions as opposed to rotational grazing.



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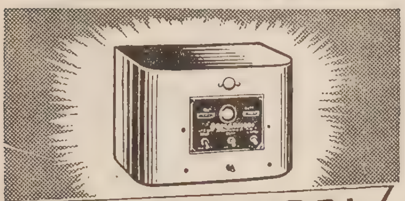

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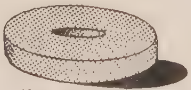

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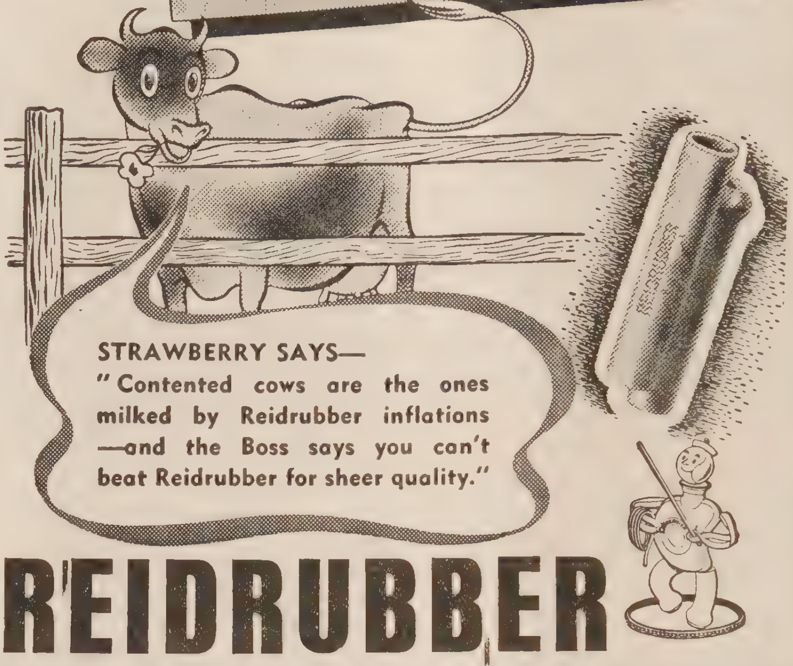

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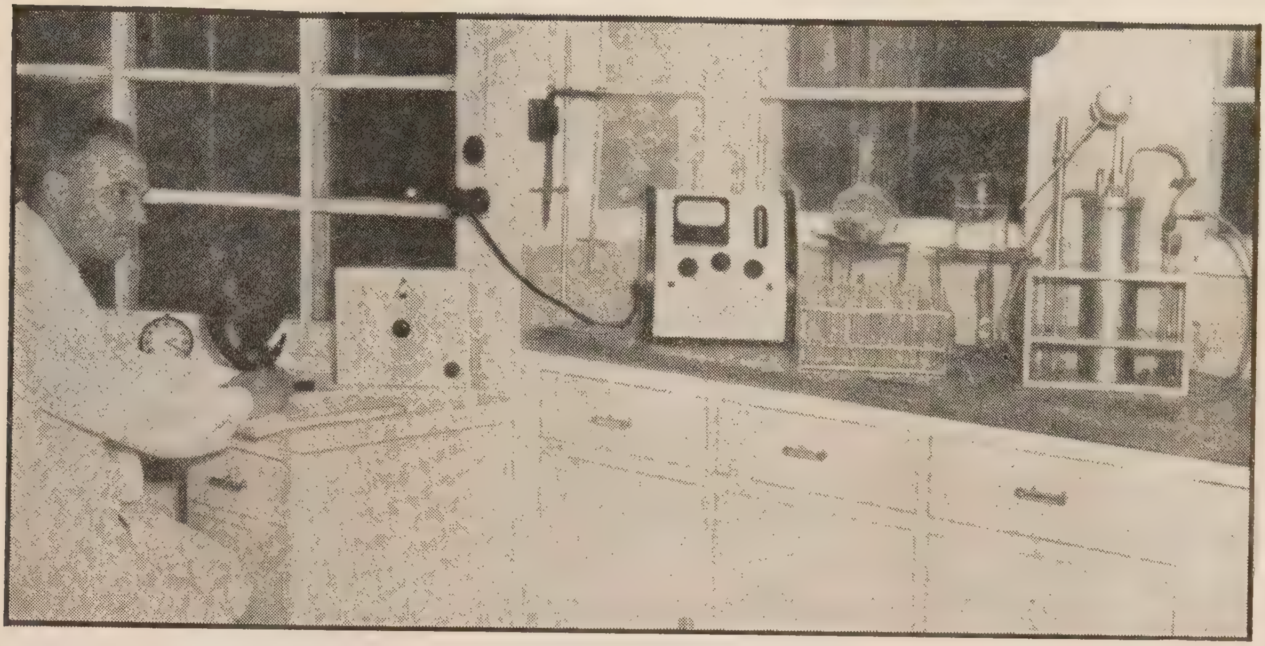
Control and Delivery of Market Milk



Part of a well-equipped and efficient laboratory in a depot in Christchurch.

COMPLETING the story of market milk from the dairy farm to the consumer, this article is the fourth of a series by T. P. J. Twomey, Superintendent of Market Milk Production, Dairy Division, Wellington. It describes briefly the work of a treating house and the tests carried out on the milk, systems of distribution, and the newest development in the industry in New Zealand—the control of milk processing by local bodies. Previous articles in this series appeared in the December, January, and April issues of the "Journal."

ONCE the filled and sealed bottles of milk are placed in the cool store they are safe from deterioration, as the temperature at which they are stored is about 40 degrees F. This temperature is maintained by refrigerating equipment using ammonia, freon, methyl chloride, sulphur dioxide, or carbon dioxide as a refrigerant. Refrigerating units in New Zealand milk cool stores are usually of the small direct-expansion type and use freon as the refrigerant; units operating on the much heavier milk-cooling duties usually use ammonia.

Refrigeration

Artificial cold is produced by the evaporation of any liquid, because the liquid has to absorb heat before it can begin to evaporate. The cold feeling on the skin when some petrol is spilt on it is caused by the heat of the skin evaporating the volatile petrol—in other words, the petrol is evaporated at the expense of the heat of the skin. Refrigeration engineers use not petrol but a liquid like ammonia which has a boiling point so much lower than petrol that normally it exists as a gas instead of a liquid.

However, it would be no more practicable to keep on evaporating liquid ammonia to maintain a cooling effect than it would be to keep pouring petrol on the skin to keep it cool, so a means has to be devised to trap the ammonia as soon as it becomes a gas so that it can be used over and over again, and that is done by allowing evaporation only in an enclosed circuit. But the ammonia refuses to evaporate unless the circuit is divided into a high-pressure side, where the ammonia exists as a liquid, and a low-pressure side, where it exists as a gas after evaporation. The gas is pumped from the low-pressure side back to the high-pressure side as a compressed gas by a compressor; to turn the hot gas back into a liquid it must be cooled, which is done with water flowing over the outside of the tube containing the ammonia gas, and that is called the condenser. To complete the circuit, a special valve between the high-pressure (liquid) side and the low-pressure (gas) side releases the liquid only in a very fine stream so that it evaporates into a gas at once and rapidly cools all round it; this valve is called the expansion valve and the place into which the thin liquid stream flows is called the evaporator.

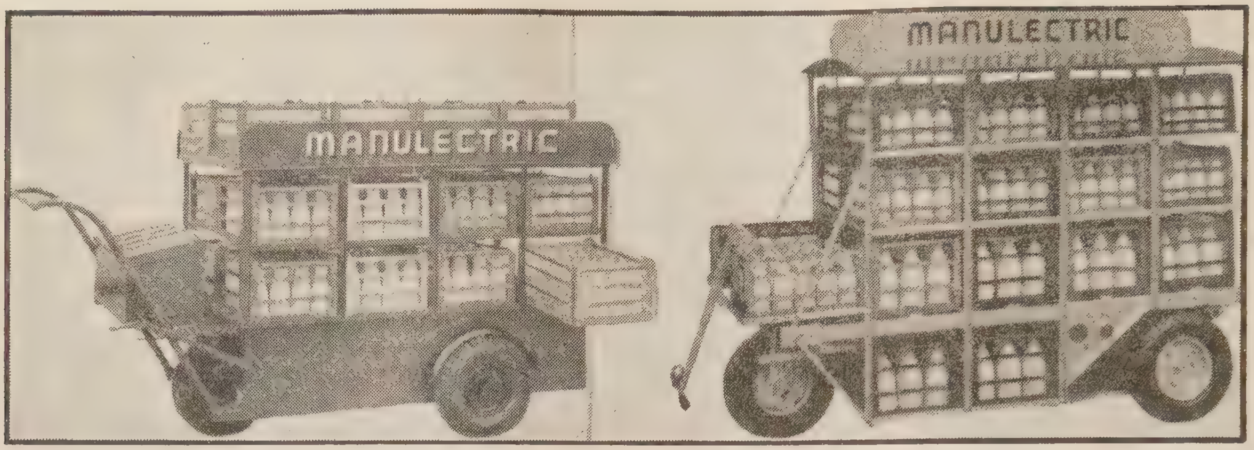
And that is the cycle of operations: The compressor (the little engine heard whirring in a domestic refrigerator), the condenser (which may be seen as a big, wooden-covered, wet-looking affair on top of a freezing works), the expansion valve (which is usually automatic and very unimpressive), and the evaporator (which is the cool store, or the ice-encrusted part of the shop refrigerator). In a milk-treating house this cycle in the refrigerating equipment follows exactly the same course as in the smallest household refrigerator. It is simple and nearly fool-proof and more than anything else has contributed to the success of modern economical milk treatment.

The size of refrigerating plants in a milk-treating house may be judged from the fact that the use of ice alone to cool 1000 gallons of milk in an hour would need the making and using of nearly 45,000lb. of ice.

Generation of Steam

If a modern dairy could not operate efficiently without refrigeration, it could not operate at all without boilers to produce steam. Without steam to kill them germs would flourish to such an extent that milk would sour before the customer received it, and, worse still, disease-bearing germs could not be eradicated if they got into the plant and the milk, and the bottle of milk would be so much poison instead of so much food.

Boilers, whether they are like the small electrically-heated unit in a farm dairy or like the enormous automatically-operated one in a city power station, are identical in their operation and really differ only in their size. To cause cold a liquid is evaporated into a gas—in other words, the heat is extracted from everything near the place where the liquid evaporates. The heat to evaporate or boil the liquid is supplied by the product being



Hand-controlled electric milk-delivery prams carrying 60 gallons (left) and 75 gallons.

cooled, and this heat is disposed of in the condenser. In a boiler heat is used instead of cold, but just the same a liquid (water) is boiled or evaporated into a gas (steam). To do that the heat is abstracted from burning coal and the heat in the steam used to heat the milk for pasteurising; in the process the steam condenses back into a liquid, just as in the refrigeration cycle. In the refrigeration cycle the heat abstracted from the product cooled is discarded; in the boiler system the cold abstracted from the product heated is discarded.

A boiler consists of a strongly-built steel body which holds the water and steam under pressure, a firebox to hold the fire and direct the heat on to the body containing the water, and a chimney to remove the smoke and dust from the firebox after the fuel has been burnt to generate the heat. There are many different types of boilers—cross-tube, water-tube, vertical, locotype, single-pass, double-pass—but that most widely used in New Zealand milk plants is the horizontal, brick-set, multi-tubular, fire-tube type. In England small plants often use vertical water-tube or multi-tubular, fire-tube boilers, and large plants almost invariably use big, horizontal, self-contained, fire-tube types or brick-set Lancashire types.

Fuel for firing the boilers can be coal, timber, oil, peat, sawdust, or almost anything else that can burn. Coal and oil are most widely used throughout the world, though in countries where hydro-generated electricity is available cheaply electricity can be used economically. Coal is fed into a boiler either manually as lumps or mechanically as small nuts, slack, or pulverised dust. Oil is sprayed into the firebox under pressure and in some installations is warmed before being fired to make the burning of the oil still fiercer.

However, whatever type of boiler is installed and whatever type of fuel is used to fire it, plenty of steam must be available in a milk-treating plant. Steam is a first-class and economical sterilising agent, and sterilisation is an essential for the hygienic operation of a milk plant. Even a moderate-sized plant will use as much as 3000lb. of steam every hour, and big depots need boilers to produce 30,000lb. and more.

Work of the Laboratory

Ideally, milk plants could not work without a laboratory, but practically and commercially too many do, and the result is that many of them work unnecessarily in the dark.

An analogy between a treating house and the human body will show where the laboratory really fits in. If the milk is considered as the day's work, the body itself as the building, and the items of plant as the organs, then the steam is the blood, the refrigeration the life of the body, the office the brain, and the laboratory the conscience. The laboratory picks out the good milk from the bad as it is received from the farms, checks the efficiency of the treatments to which the milk is subjected, and finally checks the cleanliness of the plant itself after it has been dismantled and scrubbed each night.

Following are brief descriptions of some of the more usual tests carried out in New Zealand milk-treating houses.

Butterfat test (the test for richness): The butterfat content is ascertained by dissolving out the non-fatty parts of the milk with strong sulphuric acid, then whirling the sample rapidly to bring the fat to the top of the testing bottle, where it can be read off as a percentage. The legal minimum in New Zealand is 3.25 per cent., in England 3 per cent., and in America 3 to 3.5 per cent., depending on the State.

Solids-not-fat test (the test for food value): For this test the chemist can evaporate all the water from the sample of milk and weigh the dry matter which remains. From this figure he deducts the amount of fat found by the first test and thus ascertains the percentage of non-fatty solids in the sample. This test can also be done by finding the specific gravity of the milk, and then by using a special formula the solids-not-fat can be estimated accurately. The legal standard is 8.5 per cent. in England and New Zealand and varies between 8 and 9 per cent. in America.

Bacterial plate count (the test for care in production): The number of bacteria present in the milk is estimated by this test, which is carried out by mixing a known quantity of milk with a special jelly-like food on which milk-borne bacteria can thrive. They grow rapidly on this medium, and the colonies which they form soon become visible to the naked eye. After a specific time—usually 48 hours—these colonies are counted, and as the amount of milk from which they grew is known the total can be expressed as "colonies per millilitre." No set standard for the plate count is now used in New Zealand, but counts above 100,000 per millilitre are poor to bad and below are fair to good. Pasteurised milk should have a lower count than average raw milk, and in America, where certified pasteurised milk is the highest-quality and highest-priced milk on sale, the maximum permitted plate count is as low as 500 per millilitre.

Methylene blue test (the test for keeping quality): By ascertaining how long a fixed quantity of milk takes to decolorise a special dye called methylene blue, this test indirectly measures the bacterial content of the milk. The test is also called the reductase test, and being simple in operation is widely used even where few or no other laboratory facilities are available. Legally milk should not reduce the dye in four hours or shorter in this country; in England the corresponding time is four and a half hours. Good milk should give a reading of more than six hours.

Coliform test (the test for sanitary quality): The coliform group of bacteria thrives in dirt, manure, and animal and human bodies, and if they are found in milk, it can safely be assumed that they got there by contamination of the milk through careless handling somewhere. An indirect method of ascertaining their presence in a sample of milk is used in day-to-day laboratory work. These bacteria produce gas, and by letting them grow

HOUSEHOLD DELIVERY OF MILK

A popular English one-ton electrically-driven milk-delivery van with permanent roof and partially-enclosed body for carriage of special dairy produce.

in a special medium the chemist can detect the presence of the gas. If no gas appears, he assumes no coliform bacteria were present in the sample. Legal standards in most countries require that no coliform bacteria should be present in milk.

Phosphatase test (the test for safety): This test for inefficient pasteurisation is very delicate and can show the presence of as little as one-fifth of one per cent. of raw milk in a sample of pasteurised milk. The result of the test is recorded in Lovibond blue units, and legally all samples of pasteurised milk should read not more than 2.3 such units. Satisfactory compliance with this test is a guarantee of safety in pasteurised milk, and the test can show even a very small deviation from the standards of safety.

Sediment test (the test for cleanliness): The amount of extraneous matter, such as dust, straw, or hair, which might have found its way into the milk at milking time is ascertained by this test. A fixed volume of milk, usually one pint, is drawn through a close-meshed filter disc of standard diameter, and the resulting disc is compared with a set of standard discs. The disc of a pint of properly-filtered and pasteurised milk shows no visible sediment.

Freezing point test (the test for adulteration): Milk can be adulterated either by adding water or by removing cream, and to find out if any such adulteration has taken place the chemist checks the freezing point of each suspected sample. Fortunately the temperature at which normal milk freezes is constant irrespective of the breed of cow or other factor, and any deviation from this freezing point indicates the extent by which the milk has been adulterated. The test is delicate and shows up even small attempts at adulteration.

Work in the laboratory of a modern milk-treating house is both varied and interesting, and in most countries girls appear to take happily to it, though in the bigger laboratories the head chemists are usually men. Work in such laboratories is highly skilled, and in New Zealand the staff for such places will be recruited in future from the ranks of suitably-qualified students from Massey Agricultural College. To encourage the right type of individual to seek a career in the laboratories, steps are being taken to institute a bursary scheme giving likely entrants financial assistance to attend the necessary courses of training at Massey College. That is wise and far-sighted, particularly in view of the substantial increase in the numbers of laboratories which will be operated by treating houses in the future.

Distribution

Distribution is the last link in the chain connecting the producer with the consumer of milk, and a weakness in this link can destroy much of the good already done by other people in the chain.

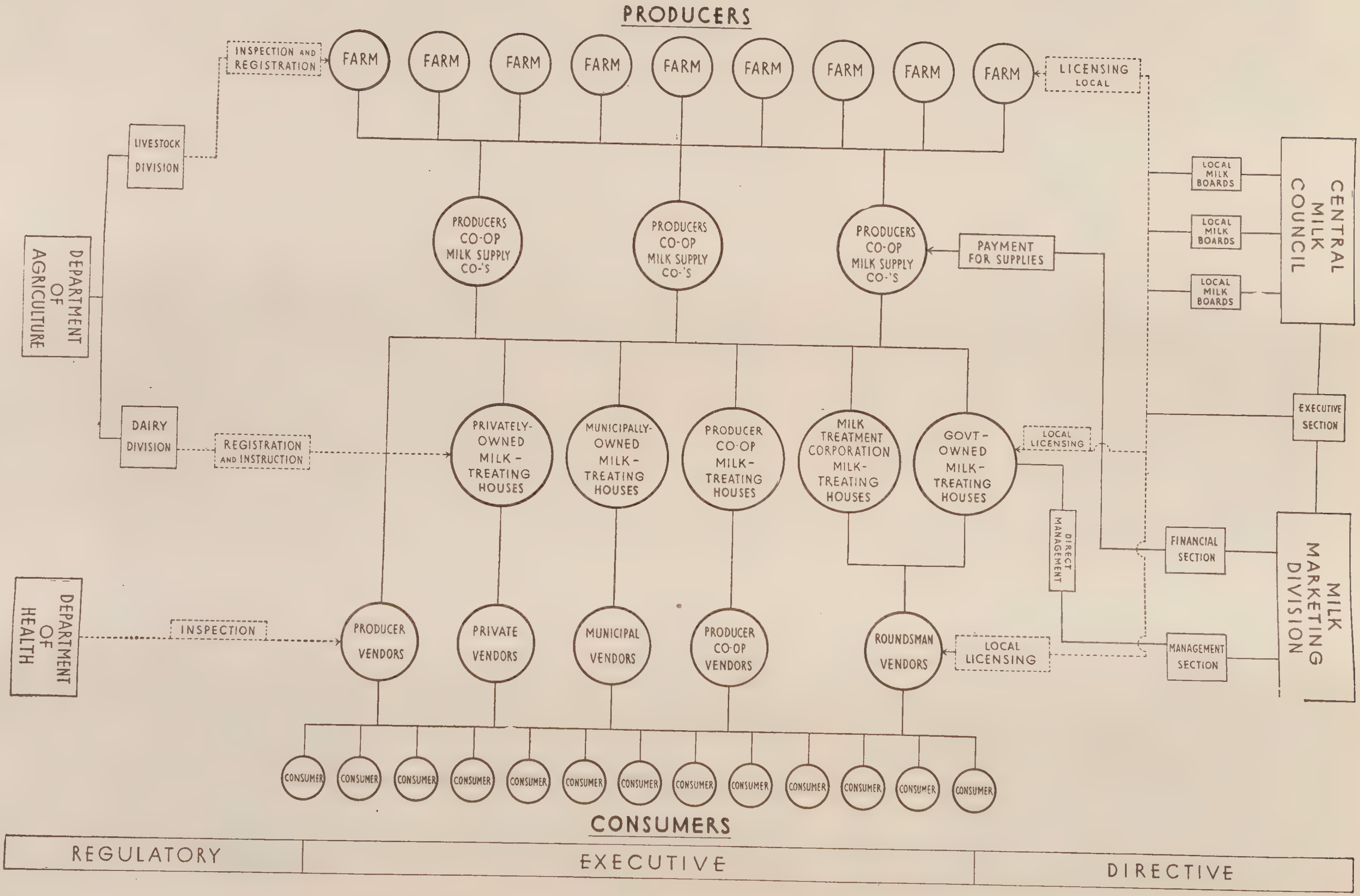
In New Zealand milk is delivered in motor vans or on horse-drawn floats, but rarely in a vehicle which has been properly designed for the work. Horse-drawn floats are usually entirely open and the bottles are exposed to dust, sunshine, and rain; a motor vehicle may have a van type of body, but the chances are it too has an open body. Other countries have endeavoured to do something about this carelessness, and many cities have ordinances specifically prohibiting open milk-delivery vehicles. Admittedly the design of a really suitable unit is not easy, but as a minimum it should be provided with a fixed roof—not a tarpaulin which would be at the driver's discretion to remove—which will give protection from the direct rays of the sun and will save the tops of the bottles from being pulped by heavy rain. An improvement on this design would be roller-shutter sides and either a fixed or roller-shutter back; the advantage of the roller-shutters is that during the long trip from the depot to the first customer the shutters can be left closed, and during house-to-house delivery the shutters can be left up to save the roundsman's time.

The means of propulsion of a milk-delivery vehicle may be manual, petrol engine, pedal cycle, horse, or electricity. The influencing factors are the average load carried and the type of district through which the vehicle has to travel. The average load in New Zealand varies from about 60 gallons to 120 gallons a delivery, which has meant a preponderance of the heavier type of vehicle, such as the horse-drawn float or the petrol-engined van or truck.

In England the load varies from 30 to 100 gallons and more, and the variety of vehicle in popular use is correspondingly larger. The small rounds, often run in conjunction with a dairy shop, are done on specially-fitted carrier cycles or on properly-equipped tricycles; the medium-sized rounds are covered by petrol-engined or battery-propelled electric vans, and the larger rounds are done with electric trucks, motor vans, or horse-drawn floats. The smaller rounds can also be worked on a vehicle which, while operated electrically, is controlled by the roundsman walking either in front or behind it. These vehicles are ingenious and practically fool-proof in operation, the only manual operation being the grasping of a control built into the handle which makes the machine stop or go at a comfortable walking pace. These vehicles, like their bigger brothers which can carry up to three tons, are powered by batteries. The batteries, which need not be removed from the vehicle during the process, are plugged into electric supply points in the depot each night so that they are kept at full power. This arrangement has many advantages, not the least of which is the cheaper rate at which electricity can be supplied during the

Rural milk delivery in England by half-ton electric truck.

THE ORGANISATION OF THE MARKET MILK INDUSTRY IN NEW ZEALAND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Two-ton electric trucks used for city delivery in western England.

night hours by many electricity undertakings. Electric vehicles for straightforward road use and more suitable for larger loads and a seated driver can travel at up to 20 and 30 miles an hour.

In Continental countries methods of retail delivery do not deviate greatly from those already described, though in some countries deliveries have to be made by sled in wintertime, and small local deliveries are made by dog carts in certain rural areas of western Europe. In Scandinavian countries rounds reach figures in excess of 200 gallons in certain cities, but that is because of the preponderance of shop trade. In Stockholm, for instance, customers electing to buy their daily milk from the dairy shop "round the corner" can buy it more cheaply there than if they had it delivered; in other words, delivery is undertaken at a premium.

One of the features making American milk distribution practice very different from what New Zealanders are used to is the habit of delivering many other dairy products on the same round as that on which the milk is delivered. It has a lot to commend it, both for the housewife and from the commercial viewpoint. The housewife has the dairy's current price list hanging in her kitchen and she orders from that—either by telephone or from the roundsman—what she wants in the way of butter, cream, eggs, cheese, and other products. The practice had gained considerable popularity in England before the war and orders for similar products were being solicited and delivered by enterprising dairymen and roundsmen. A remarkably-popular sideline which many dairies delivered was fresh orange juice. This was the genuine product, made in the dairy from fresh oranges, filled into returnable bottles in the same way as the milk, and delivered each morning with the milk—a very pleasant way of obtaining vitamin C.

Price Structure

In New Zealand, as in Britain today, milk prices are subsidised—that is, the selling price to the consumer is not necessarily or directly related to the price paid to the farmer. That is not the case in America or in several other countries, where the price at which the customer buys the bottle of milk is the total of all the costs of buying, transporting, testing, assembling, storing, and delivering the milk.

The structure of the market milk business is simple to those engaged in it but may appear complicated to others; study of the diagram on the opposite page may make the subject a little clearer. Farmers sell their milk at a price guaranteed by the Government through their co-operatively-owned supply companies; these companies sell the milk to the milk-treating houses, which treat and bottle it and sell it to the vending dairymen. The margin allowed for each service—farm cooling, transport, chilling, pasteurising, bottling, and vending—is rigidly fixed by the Government through the Milk Marketing Division, and they are so set that inefficient management in any one of the services will find it difficult to make a profit, while efficient management will reap its just reward.

New Zealanders are accustomed to prices of 6d. to 7d. a quart for milk, but in England the price is 9d. to 10d. a quart, in Ireland 9d. to 1s., in Sweden 10d. to 11d., and in the United States 1s. 2d. to 1s. 5d. (New Zealand currency).

Milk-treatment Corporations

The newest development in the market milk industry in New Zealand is the transfer of a majority of existing milk-treating houses to municipal or local body control. This action arose out of the findings of the Milk Commission in 1944 and the subsequent recommendation that, because of the influence of milk processing on public health, the treatment of milk should become the responsibility of local bodies. That arrangement is not new to New Zealand, as the Wellington City Council, with a far-sighted municipal consciousness, has handled milk treatment and distribution on such a basis for many years.

One of the first problems to be faced in the transfer of milk-treatment responsibilities to local body control has been the need for re-equipping plant and premises, and to facilitate this huge undertaking the Government, through the Milk Marketing Division, has undertaken to modernise some of the existing treating houses, to rebuild those totally unsuitable for modernisation, and generally to put modern and adequate milk-treatment facilities at the disposal of the local bodies concerned. With the delays inevitable in obtaining machinery today and the difficulties in the way of the erection of suitable buildings, very rapid progress in the modernisation of market milk plants cannot be expected. Nevertheless, replanning and re-equipping are going ahead and the final result within the next few years should be something well worth waiting for. New Zealand can take a justifiable pride in blazing a trail which other cities and countries well may follow in years to come.

Part of the fleet operated by a well-known New Plymouth milk-treating house. The loads carried in New Zealand have meant a preponderance of the heavier type of vehicle.

DEVELOPMENT OF WATER RESOURCES

Above — A gateman's cottage in Nebraska. Right—A combined power plant and irrigation supply canal in the Logan Canyon, Utah. Below—Farm buildings for settlers on a Federal Government irrigation development project in Nebraska.

Multi-purpose Development of America's Water Resources

By N. LAMONT, *Assistant Irrigation Officer, Ashburton.*

IN New Zealand, where no place is more than a few hours' walk from a natural water supply, it is difficult to appreciate fully the outlook of people living in or near great desert areas, where for hundreds of miles there were only barrenness and arid wastes, and life at any level was possible only by carefully husbanding every drop of water, storing it, and perhaps conveying it over long distances through costly structures. To the residents of the western United States of America water means existence, and out of their arduous and sometimes bitter experience during the past hundred years of progress they have evolved techniques of development of water resources that have reached an extraordinarily high standard.

> "The multiple-purpose project which serves many uses is a relatively-new conception—an expression in engineering terms and concrete and steel of an awakened social consciousness. There was a time when a dam was designed for irrigation only; when a structure for the improvement of navigation was designed with that single thought; when a power dam was a power dam and nothing more to the designer and operator. Fortunately that day has passed. Today dams exercise several functions simultaneously—the irrigation of desert lands and the creation of new opportunities to make homes and to build communities; providing low-cost power for farms, homes, and cities, for mining and processing minerals, and for manufacturing the essential machine tools of modern industrialised civilisation; and through other services wrung from unwilling rivers."
>
> *—From the "Reclamation Handbook," U.S. Bureau of Reclamation.*

NOT all irrigation developments in the U.S.A. have been successful. Probably the major cause of failure was inexperience and lack of essential information in the days before research was organised in engineering, agriculture, and meteorology. Occasionally projects failed through soils being unsuitable for irrigation, because of low fertility or proneness to alkali formation, and occasionally inefficient engineering was the principal cause of failure. But much more often the failure has been financial, largely caused by over-optimistic estimates of the ability of agriculture to repay construction costs. Projects initiated in times of prosperity in a spirit of high optimism have been called on in periods of depression to bear costs which they were simply incapable of carrying.

Planned Use of Resources

Less than one-sixth of all past irrigation development in the U.S.A. was carried out by Federal Government enterprise, and financial troubles have been encountered in Government as well as private projects. However, the Government Departments responsible, the Bureau of Reclamation and the Department of Agriculture, appear to have learned their lessons thoroughly, and their planned approach to irrigation development now leaves little chance for errors of judgment.

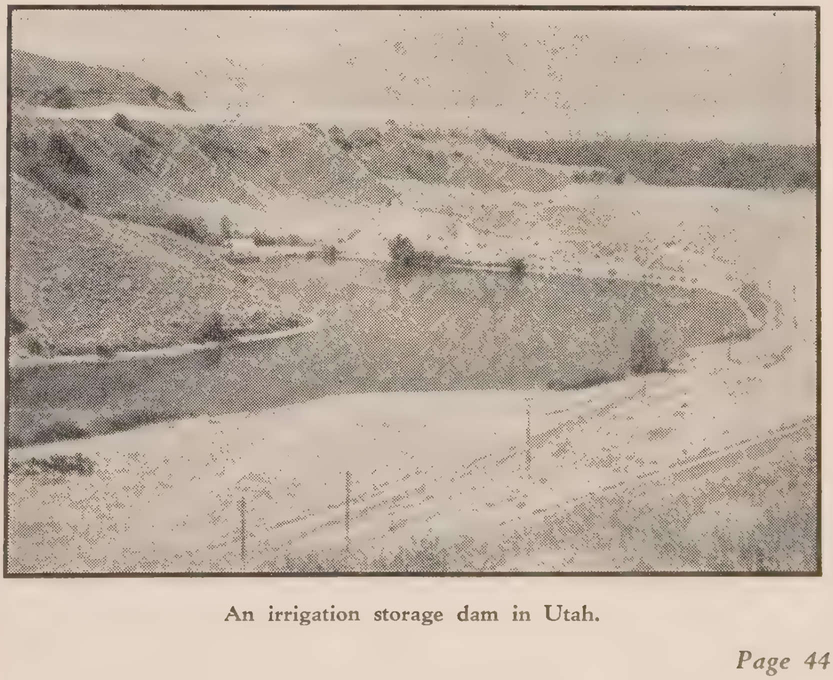
Development today usually presents much more difficult technical problems than those faced by the pioneers, and the further 20,000,000 acres of potentially-irrigable country that remains for development in the U.S.A. is almost entirely country that was considered by private enterprise too difficult or expensive, usually because of its inaccessibility to a reliable water supply.

The modern approach to development is by carefully-planned surveys of all relevant factors. From long-term meteorological records, with the aid of the relatively-new applications of the science of dendrology, which from tree-ring studies can recreate a climatic picture for hundreds of years past, a thorough understanding of the extent of the need for supplemental water is possible. From accurate soil surveys and analysis of agricultural practices and returns on existing irrigation areas, plus experiment on the proposed new delelopment, a fairly-accurate forecast of the potentialities of the project can be obtained. The engineers also produce their estimates of construction, operation, and maintenance costs.

Sharing the Cost Burden

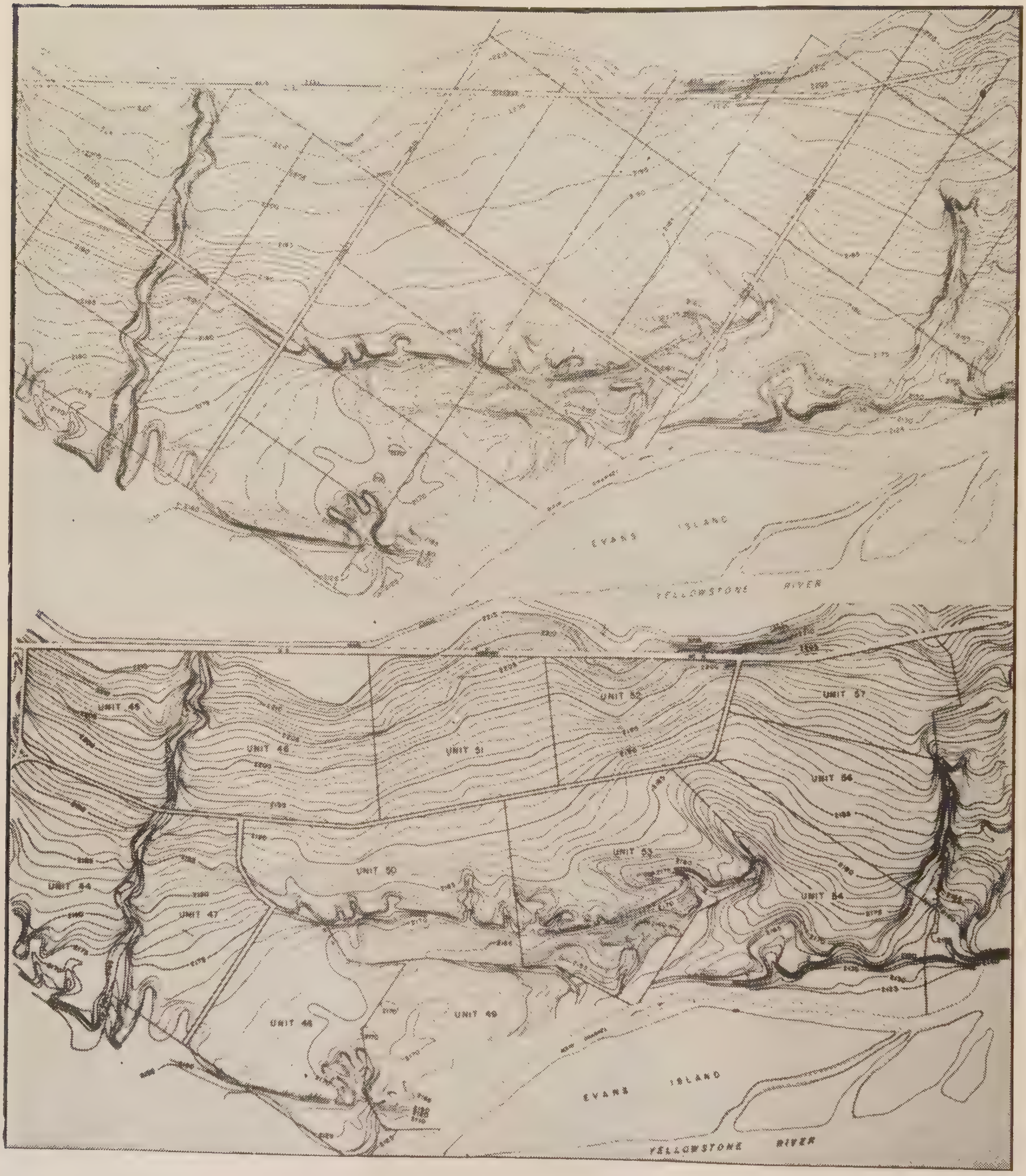
As a consequence of the difficulties of developing the land which remains to be irrigated, these estimates almost invariably show that agriculture alone would be unable to carry the cost burden and repay all capital expenditure in the manner attempted but not often achieved by earlier developmental agencies. But with modern techniques of water resource development, agriculture is not expected to carry the whole burden.

In the first place, it is generally accepted in the U.S.A., and already being evidenced in practice, that the farmer water-users are not the only ones to derive benefit from irrigation



An irrigation storage dam in Utah.

RELOCATION OF FARM BOUNDARIES IN WESTERN STATES TO SUIT CONTOURS FOR IRRIGATION


EVANS ISLAND
YELLOWSTONE RIVER
UNIT 45
UNIT 46
UNIT 51
UNIT 52
UNIT 57
UNIT 56
UNIT 44
UNIT 47
UNIT 50
UNIT 53
UNIT 55
UNIT 48
UNIT 49
EVANS ISLAND
YELLOWSTONE RIVER

[*United States Department of Agriculture.*

When surveyed in the early days much of the land in the western States was simply cut up into mile-square blocks. When this type of subdivision is placed on a contour map, as in the upper plan, in many cases the farm boundaries are very badly placed for efficient designing of irrigation systems. In such cases boundaries are relocated as in the lower plan to suit contours.

development, and that the whole region—farmers beyond the boundaries of the watered country, business men of adjacent towns, and manufacturers of quite distant centres—derives benefits from increased agricultural activity.

Even where multi-purpose ideas cannot be put into effect, to expect water-users to assume responsibility for the total capital cost of irrigation works is no longer considered just, though operation and maintenance charges for irrigation works are their sole concern.

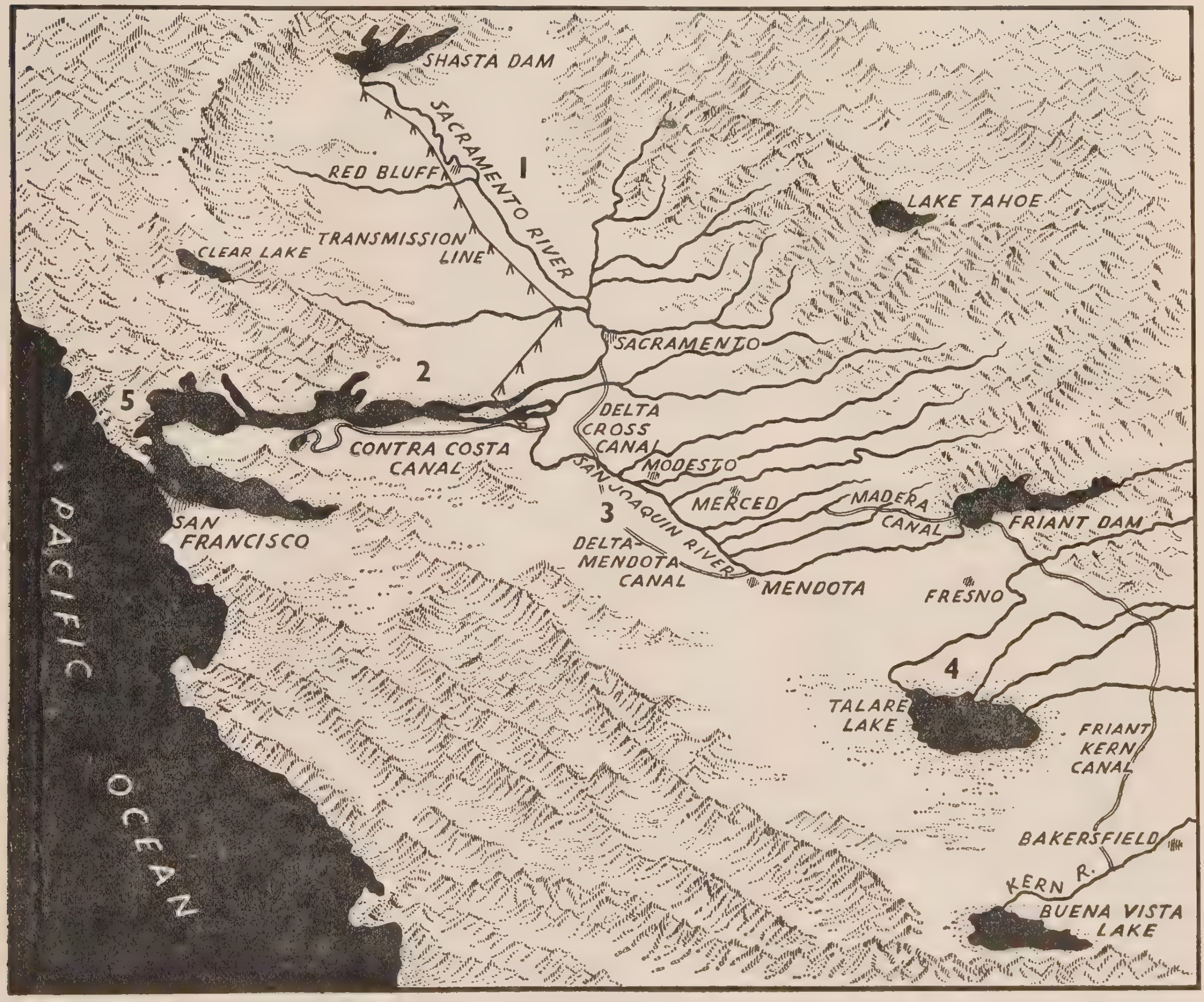
More of the financial burden is taken from the irrigator by the use of irrigation storage dams for other purposes, such as electric power, flood control, and river navigation. As these additional benefits usually add comparatively little to the total cost, the spreading of the financial burden over all makes it relatively light for each.

Great Central Valley Project

Probably the best way to illustrate some of the principles of multiple-purpose resource development is to describe one of the most interesting examples, if not one of the best-known. Perhaps none is a better-known example than the much-publicised Tennessee Valley, and most people have heard of great structures like the Boulder and Grand Coulee Dams. But for complexity and variety of problems and ingenuity of solution there are few more fascinating examples of the multiple-purpose technique than the Great Central Valley projects of California. Scarcely a part of the State is not affected by this project, and its completion will have a tremendous influence on the agriculture of the 20,000 square miles of the Great Central Valley, and in fact on the prosperity and well-being of the whole 7,500,000 population of California.

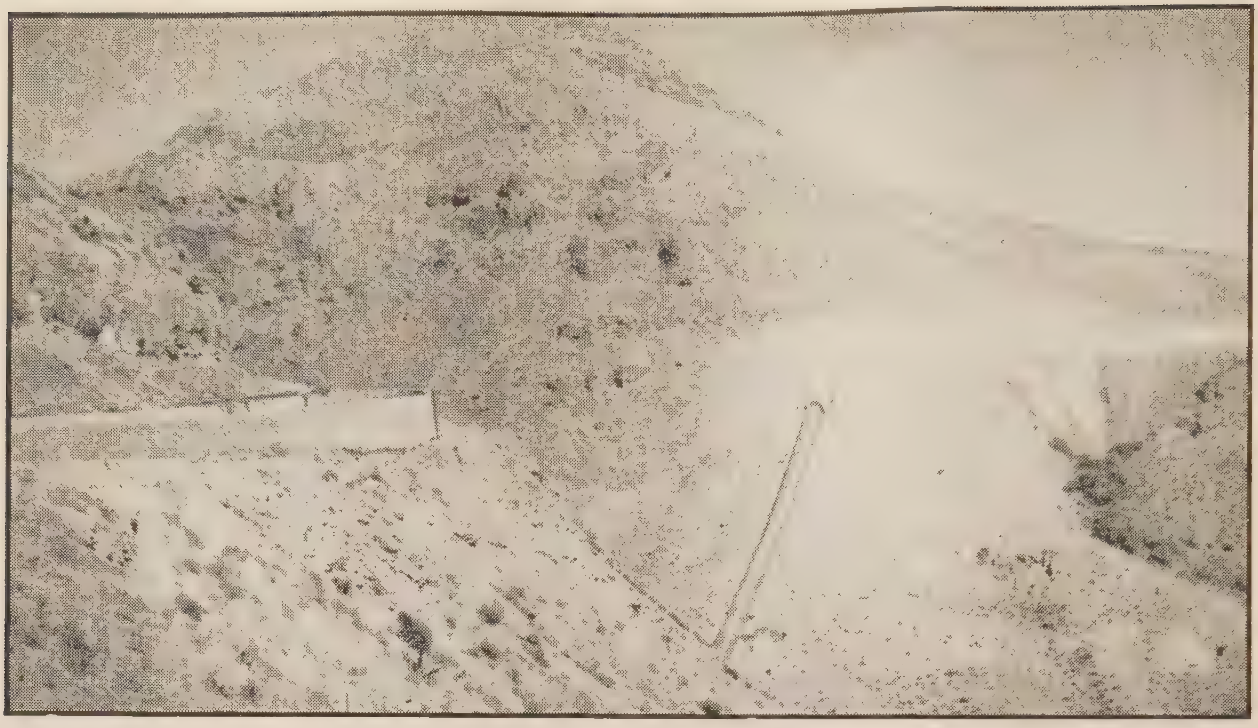
The problems of the Central Valley are more easily understood by referring to the map on this page. The valley is watered by two principal rivers, the Sacramento flowing from north to south and the San Joaquin flowing from south to north, the two meeting in the delta region and together flowing into San Francisco Bay. The problems were:

1. The Sacramento River carries probably two-thirds of the water supply of the whole Central Valley, though only about one-third of the irrigable land of the valley lies along its banks. It tends to flood and is navigable only up to about the city of Sacramento.
2. The erratic river water supply and the heavy draw-off for irrigation



SHASTA DAM
SACRAMENTO RIVER
1
RED BLUFF
TRANSMISSION LINE
CLEAR LAKE
LAKE TAHOE
SACRAMENTO
2
5
DELTA CROSS CANAL
CONTRA COSTA CANAL
MODESTO
SAN JOAQUIN RIVER
MERCED
MADERA CANAL
FRIANT DAM
3
SAN FRANCISCO
PACIFIC OCEAN
DELTA-MENDOTA CANAL
MENDOTA
FRESNO
4
TALARE LAKE
FRIANT KERN CANAL
BAKERSFIELD
KERN R.
BUENA VISTA LAKE

The Great Central Valley project.



A bench flume and steel siphon for conveying irrigation water from its source to the farm lands of Idaho.

at times subject the delta area and the fringes of the bay area to salting from San Francisco Bay to a degree that affects water supplies for irrigation and industrial and domestic use.

3. The vicinity of the towns of Modesto, Merced, and others is probably one of the richest areas under irrigation and one of the most diversified in types of farming in the world. Further expansion of irrigation and even the maintenance of present productivity is threatened in some seasons by inadequacy of water supply.
4. Further south, in the Fresno-Bakersfield area, inadequacy of water supply is even more serious and has prevented potentially-rich irrigation developments. The San Joaquin River carries only about half the water carried by the Sacramento, though its valley contains twice the area of irrigable land.
5. The San Francisco Bay urban and industrial area, enormously expanded by war industries, was threatened with electric power shortage.

Solution of Problems

Such were the problems of the Great Central Valley—flooding, navigational troubles, shortage of water for domestic, industrial, and irrigation uses, pollution by salt of existing water supplies, and a threatened power shortage in the greatest industrial area of the west.

The ingenuity of the multiple solution to a multiple problem is worthy of that great organisation the U.S. Bureau of Reclamation. Though in its many aspects the problem was stretched out over nearly 500 miles of valley, it was treated as a many-sided but a single problem and each part of the solution considered and balanced with every other part.

The key to this great project is the world's second largest concrete dam, Shasta Dam, rising 602ft. above its foundations with a spillway twice the height of Niagara Falls. Behind this immense structure the floods of the Sacramento River will be restrained from spreading havoc over productive farm lands and released under control, through turbines developing 450,000 kilowatts for the San Francisco Bay urban area, into a channel thus made navigable up to the town of Red Bluff. Then, after supplying local irrigation requirements and flushing the salt from the delta channels, the Sacramento will still have water to spare to help its weaker sister, the San Joaquin, first through the Contra Costa Canal to supply irrigation and industrial water for the south-eastern shores of San Francisco Bay, and secondly through the Delta Cross Canal to the Delta-Mendota Canal, which carries Sacramento water as far down the San Joaquin valley as Mendota. Relieved of obligations to its lower valley, which already were straining its capacity, and with its erratic seasonal flow also regulated behind the great concrete wall of the Friant Dam, the San Joaquin River is now to concentrate its water on augmenting the limited supplies of the Madera-Kern region through two more canals, the Madera and the Friant Kern.

Triumph over Parochialism

It is difficult to do justice to the magnitude of this great project, much less to the vision that inspired it or the engineering brilliance that is making it possible. More than 8,000,000 cubic yards of concrete, more than 34,000 acres of reservoir area, and nearly 400 miles of main canals are involved in this huge undertaking.

Perhaps, to quote the Bureau of Reclamations handbook, the most significant feature of this great Central Valley project is that it is the "expression of a new social consciousness"—an illustration of the modern technique of multiple-purpose resource development, a triumph over parochialism by the concept of geographic regionalism which places the interests of all of the people first all of the time.

Design of Poultry Incubator Rooms

By S. G. HADDON, Poultry Instructor, Palmerston North.

THE success of a season's work on a poultry farm depends on the quality of the pullet flock. Incubation practices and management can make or mar the pullets, so incubation is one of the basic operations of commercial poultry farming. Too many people do not realise this, nor do they realise that the modern incubator, particularly a cabinet incubator, is a precision machine and should be housed and treated as such. Far too many incubators are installed in surroundings which impose a severe and unnecessary load on the control mechanism. An incubator cannot function as it should if its environment is at fault.

AN incubator is primarily a machine for maintaining a constant temperature in its interior, but it also supplies fresh air to its interior in carefully-controlled amounts and is capable of maintaining the desired humidity in its interior. Therefore, an incubator shed or room should afford positive control of temperature and ventilation. Humidity is closely related to temperature and ventilation, and there is no need to incorporate humidity control in an incubator room. Temperature control of an incubator room largely depends on building design, sound materials, and careful workmanship. For example, a ridge roof and ceiling give a more uniform temperature than a lined lean-to roof; lined walls ensure a more even temperature and freedom from draughts than unlined walls; a solid wooden floor is warmer than a concrete floor.

Poultry farmers in New Zealand do not realise how fortunate they are in the climate. In America and England central heating plants in incubator rooms are the rule and not the exception to maintain the temperature within a range of 15 degrees F., beyond which the incubator cannot be expected to function satisfactorily. Careful work overseas has established that the best temperature for an incubator room is between 60 and 70 degrees F. and that a low constant temperature is better than one which fluctuates between wide limits. Fortunately in New Zealand it is not necessary to install central heating in the average incubator room. A commercial hatchery in a very bleak and exposed portion of the country may benefit from the use of a small stove, but hatchery owners should be guided by the range of temperatures shown by a maximum-minimum thermometer, which should be set daily at the same hour.

[Photo News Ltd. photo.

Design of Room

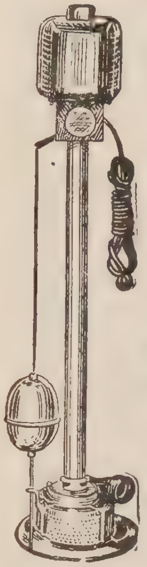
It is usually sufficient to build a room or house which is free from draught-producing cracks and crevices, has lined walls, a ceiling or at least a lined roof, and a sound floor. Windows in an incubator room are not necessary and if incorporated may cause large and dangerous fluctuations in the room temperature. If windows must be installed, they should be placed in the wall of the room on which direct sunlight never falls—that is, in the most southerly wall. Daylight is not essential for incubator work; in fact, it is often an advantage not to have to wait for nightfall or to block up windows when eggs are to be tested.

An incubator room with no openings into it other than the door would be a sorry place, and only very poor results could be expected from an incubator installed there. The atmosphere of the room must be fresh at all times. That does not mean that a continual breeze should be blowing through the room or that the temperature should be down near 30 degrees. The lined walls and ceiling, sound floor, and absence of windows will take care of the temperature, but adequate air inlets and outlets must be provided to care for the atmosphere.

Overseas research work has led to the conclusion that the air in an incubator room needs changing eight times an hour. That can be done only if properly-designed ventilation inlets and outlets are provided. A useful method is: Find the cubic capacity of the incubator room (length x breadth x average height); multiply this figure by eight, and the result is the number of cubic feet of air which must pass through that room every hour; divide this figure by 50 and the answer is the minimum area in square inches of air inlets required to achieve this end; divide the area of the air inlets by 2½, and that is the area of the air outlets needed to complement the inlets. A smaller outlet will slow down the air flow, a larger one will cause draughts at the inlets. In any case, the inlets, placed low down, should be shielded or baffled so that the incoming air is turned along the walls or down to the floor.

Placing of Inlets and Outlets

Some thought should be given to the siting of air inlets. To place them where a prevailing wind can blow through them day and night for days on end is nonsensical; such inlets would have to be blocked and the ventilation impaired to that extent. A



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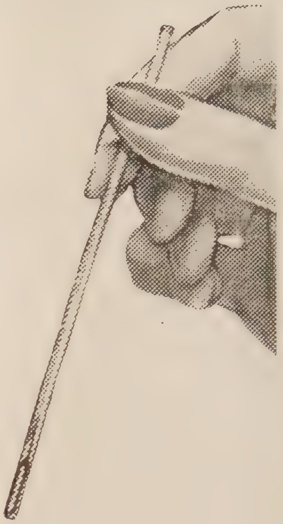

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Keep away from people who have colds.
Wash your hands freely during an epidemic of colds, and ALWAYS before meals.
Eat adequate meals, and get plenty of rest and sleep.
Exercise sensibly, dress sensibly, and don't be scared of fresh air.

IF YOU *DO* GET A COLD—

Cover up your coughs and sneezes.
Go to bed, drink fruit juices and large quantities of water, and take only light meals.
A rest-up of 24 or 48 hours in bed at the start of a cold attack may prevent serious complications and weeks of enforced idleness. It will also keep others from catching *your* cold.

Dodge colds and you dodge trouble

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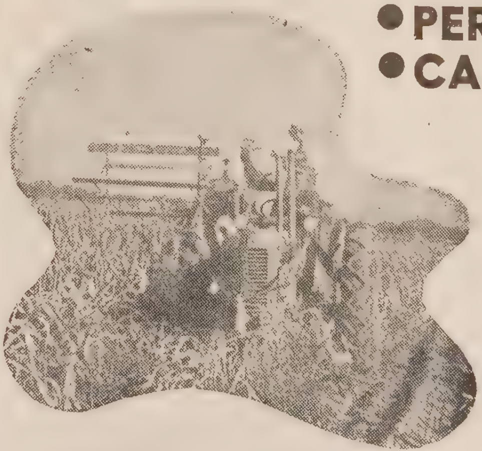

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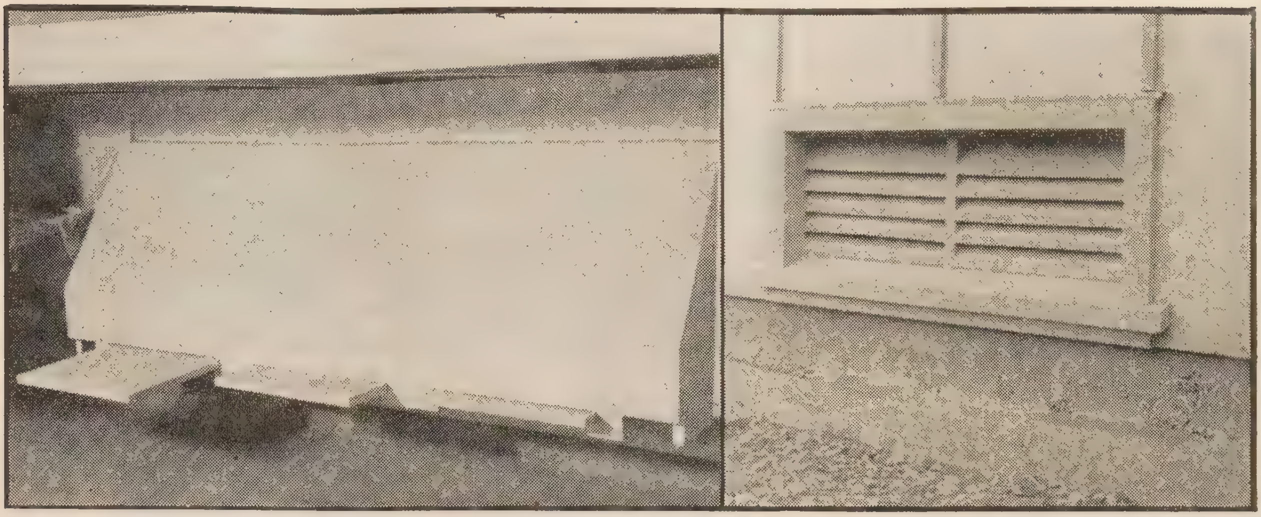


Inside and outside views of air inlets near ground level. The louvres outside are fixed, and the three slides inside can be pulled out or left closed to control the rate of ventilation.

sound plan is to have two or more air inlets placed so that one or more is always on the sheltered side of the building. The windward inlet may be partially or completely closed without detriment provided the area of the inlets left in operation is not less than the minimum as obtained by the calculations given. To block off excessive ventilation is simple but to increase the ventilation beyond the capacity of the inlets and outlets is extremely difficult.

Siting the outlets is simpler, it being sufficient to place them high up. The logical places in a room or building with a lined ridge roof are in each gable end. The outlets should be louvred to exclude weather and it may be necessary to arrange for one or other to be closed completely according to the weather. A sliding shutter on the inside of the building will achieve this. In a room with a lined lean-to roof and no ceiling, the outlets will have to be to one side of the centre line of the walls and toward the higher portion of the roof. Control shutters and louvres will be needed.

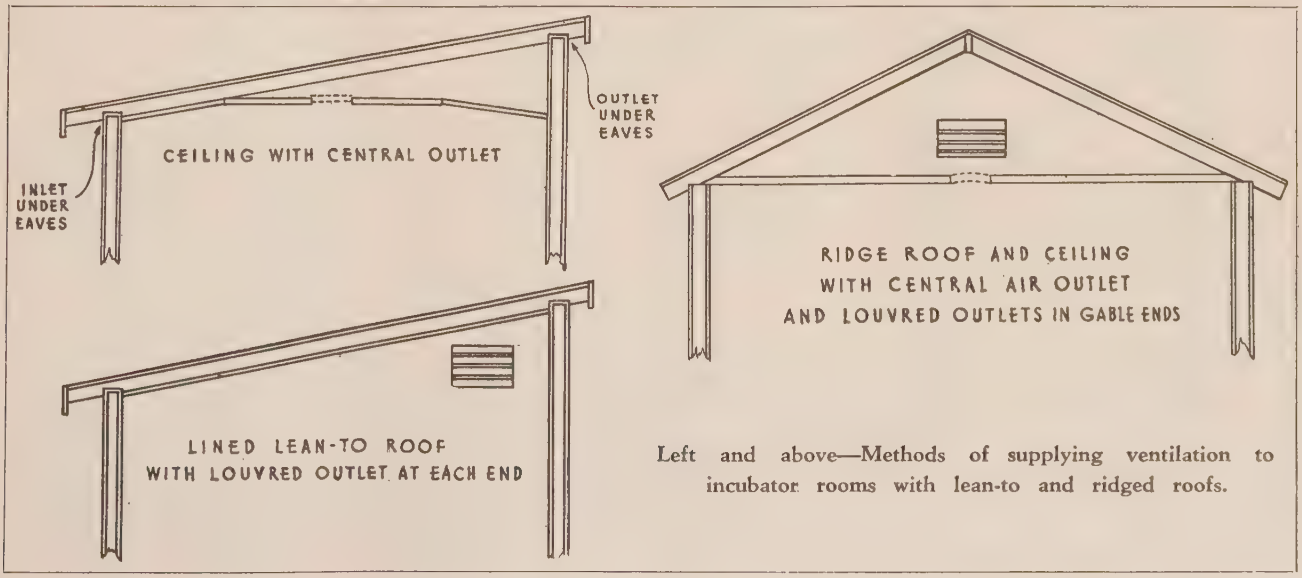
In both cases either outlet should be capable of handling the air flow from the inlets. In a room with a ceiling the correct-sized outlet should be placed centrally between the inlets. The air exhausts into the space above the ceiling and it is important to make certain that this space is provided with air outlets. Ample-sized louvred openings in each gable end are sufficient, but their total area should be at least twice that of the ceiling outlet to ensure an adequate flow of air through the ceiling outlet, which in turn controls the flow through the floor inlets. It is better to control air flow by closing the outlet somewhat than by reducing the size of the inlet, as there is then less danger from draughts at the inlets, even though these are baffled. For this reason it is advisable for all outlets to have sliding shutters.

Whether the room is for a large or small incubator, a cabinet or a flat-top type, adequate ventilation is essential.

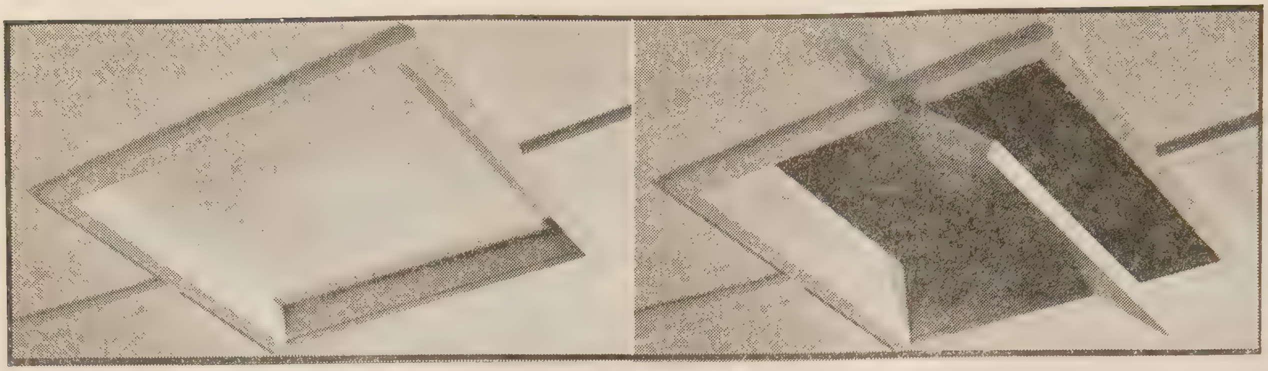
Size of Room

The size of the incubator room is governed to a certain extent by the size of machine to be housed. Most machines are housed in rooms which are far too small for efficient working and satisfactory results.

Overseas workers have found that a 10,000-egg capacity incubator requires a room containing 2250 cubic feet of air space for good results. A room 8ft. high, 14ft. wide, and 20ft. long would satisfy those requirements. Smaller machines would require proportionately smaller rooms, but there


OUTLET UNDER EAVES
INLET UNDER EAVES
CEILING WITH CENTRAL OUTLET
RIDGE ROOF AND CEILING WITH CENTRAL AIR OUTLET AND LOUVRED OUTLETS IN GABLE ENDS
LINED LEAN-TO ROOF WITH LOUVRED OUTLET AT EACH END

Left and above—Methods of supplying ventilation to incubator rooms with lean-to and ridged roofs.



An outlet ventilator in the false ceiling of an incubator room fully closed and partly open.

is a limit below which it is not practicable to go. In theory $22\frac{1}{2}$ cubic feet should suffice for a 100-egg machine, but it is obviously ridiculous to think of using a room with a length, breadth, and height of 2ft. $9\frac{3}{4}$in. The following table gives a guide to the requirements of various-sized incubators; in all cases a height of 8ft. has been assumed, so the dimensions which vary will be the length and breadth:—

Egg capacity of incubator	Floor area required (square feet)	Suggested floor dimensions (feet)
10,000 ..	281	14 x 20
8,000 ..	225	14 x 16
5,000 ..	141	10 x 14
4,000 ..	112	10 x 14
2,000 ..	56	10 x 10
Fewer than 2,000 ..		8 x 10
Flat-top kerosene type		8 x 10 or 8 x 15

Before building a room, however, always obtain the measurements of the machine which it is to house. Incubators of different makes but the same capacity vary in their dimensions; a rather long rectangular room may be eminently suited to one type of machine, but a square or nearly-square room may be ideal for a machine of another make but of the same capacity.

Some machines are double sided, others are single sided, and these variations must be borne in mind when constructing a room or fitting an incubator into an existing room. More room will be needed for a flat-top incubator than for a cabinet machine of similar capacity, but both types have the same need for ventilation and fresh air. The table given must be regarded as applying to cabinet machines and the floor areas it recommends are the minima.

Fittings of Room

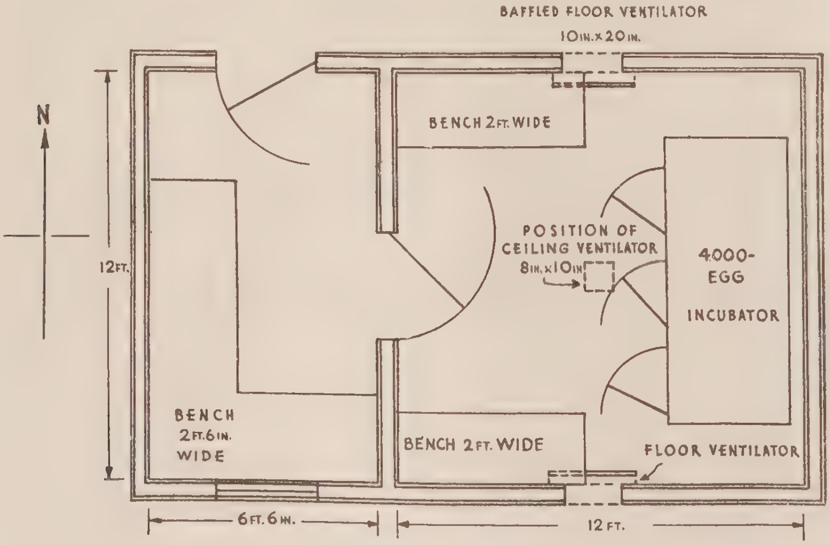
Fitting up an incubator room is largely a matter of personal taste. A bench as wide as can be fitted conveniently should be considered an essential. Do not make it so wide that it prevents an incubator door from opening properly or the back of it cannot be reached easily; 2ft. to 2ft. 6in. is quite a useful width, as incubator trays can be easily and quickly packed if they are placed on a slope with the front edge level with the front of the bench and the back of the tray resting against the wall. Some people use small wooden stops along the front of the bench to prevent the trays slipping down when being packed.

A fixed-louvre ventilator permitting a free circulation of air over a false ceiling such as that at the top of this page. A similar ventilator is required at the other end of the roof.

Provision should also be made for storing spare egg trays and chick boxes. Shelves and racks fitted above the ends of the bench or below it are convenient and do not get in the way. A wall cupboard or two for spare lamp bulbs, egg testers, egg scales, incubator spare parts, and other equipment should be considered.

With the widespread practice of chick sexing, it is wise to provide accommodation for this work next to the incubator room. There is not room for a sexer and the hatchery owner to do accurate work in the same room at the same time, except in the largest of incubator rooms, and many "sexer's mistakes" must be put down to unintentional interference when this work is in progress.

An incubator room should not be used as an egg room, except for holding sorted and graded hatching eggs. Even so, a set of racks or a cabinet for the filled trays will have to be provided, and only in the larger rooms can space be found for such fittings; as with sexing, it is much better to make special provision for handling and storing eggs outside the incubator room.



Layout for a 4000-egg incubator and egg room.

THE HOME GARDEN IN JUNE

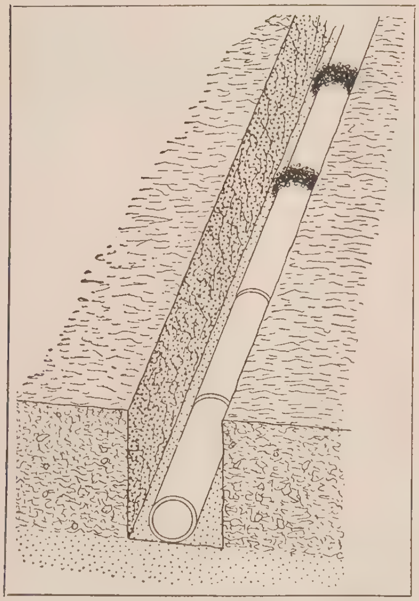
By A. G. KENNELLY, *Instructor in Vegetable Culture, Christchurch.*

EXCEPT in favourable situations not exposed to severe winter weather and where drainage and soil conditions are good, the sowing of practically all vegetable seed other than broad beans should be delayed until at least the end of June. In most districts even this will prove too early. Little is to be gained by sowing even hardy subjects such as peas, turnips, radish, silver beet, and spinach while ground and air temperatures are low and while the very important top 2 to 3in. of soil is liable to be continuously deluged with rainwater.

[*Green and Hahn Ltd. photo.*

Rhubarb crowns should be split up and replanted about every 4 years if they are to continue sending up stout stalks of the kind easily handled for cooking.

SPRING cabbage can be set out; also cauliflower in sheltered situations or in districts where winters are not too severe. Soil should be well drained and adequately enriched with organic material such as compost and farmyard or stable manure. Celery and leeks should receive their final earthing up if this work has not yet been finished, and the digging of potatoes should be completed without delay. Broccoli or winter cauliflower should be watched for signs of approaching maturity and the developing curd protected by bending or breaking a leaf or two over it. Land from which crops have been recently harvested should be dug over to improve drainage and to assist the rotting of root fibres and similar residues and to expose the soil to the weather. This not only helps to improve tilth, but exposes insect pests and their eggs to birds. Green crops that are approaching the flowering stage or are growing on land soon to be used for a vegetable crop should be turned in to rot down. If not yet done, asparagus should be cut down and the bed mulched with compost or a light dressing of farmyard manure. The compost heap can be turned or remade if required.



Field-pipe drains should be shallow enough to allow water to percolate freely into them, but deep enough to prevent cultivation interfering with them. A space of 1/8in. to ¼in. between laid tiles facilitates entry of water. Except for main drains 2in. or 3in. field pipes are suitable.

Drainage

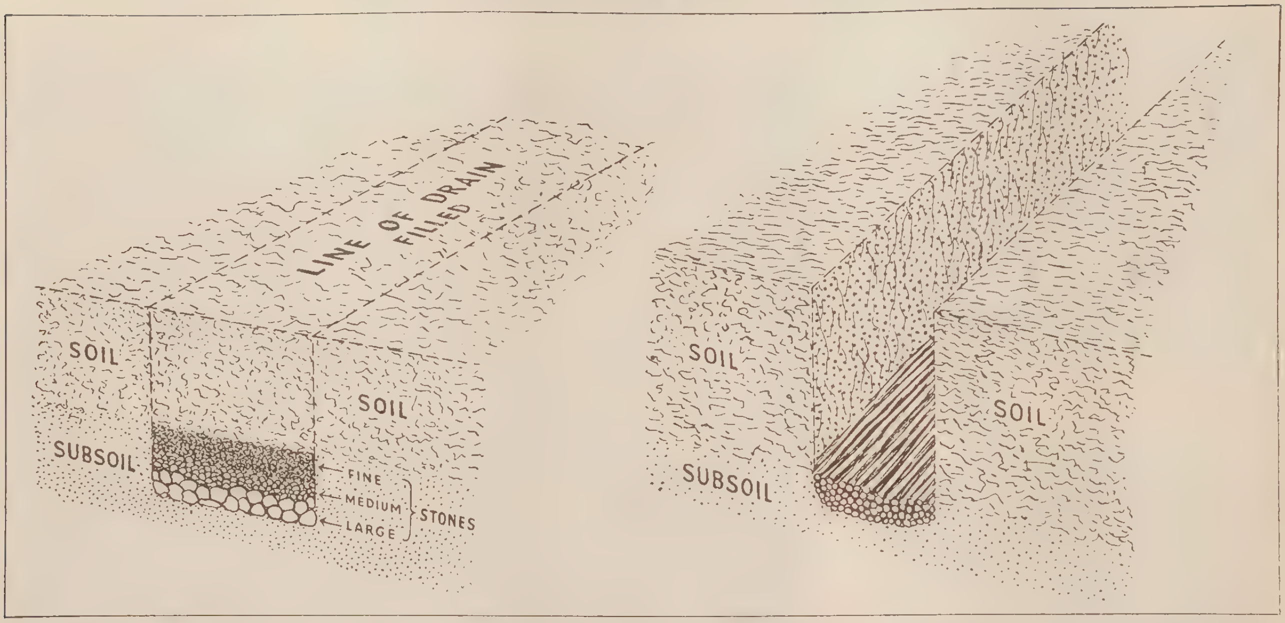
Wet areas that are now showing up should be drained by field pipes covered at the joints by open material such as stones or coke or by use of the open material alone; effective drains can also be made by digging a trench and putting manuka scrub in the bottom or, if the texture of the soil is open enough, by putting in boards to keep a channel open as shown in the diagrams on the next page. The fall need be as little as 3 to 4in. in 50ft.

Sowing and Planting

Broad beans: One of the few vegetables which may be sown throughout the winter if soil drainage is good, broad beans mature at a time when in most gardens vegetables are scarce and lacking in variety. They are particularly hardy and under average conditions can be relied on to produce a good crop. The immature pods are delicious and may be eaten whole if they are sliced in the way usually adopted for preparing runner beans for cooking. Young broad beans are quite tasty used raw in salads if they are shelled and the seeds skinned. This is not as difficult as it may seem, and with the seed coat removed the beans are sweet and tender. Beans are a good source of protein and iron and vitamins B_1 and B_2. They are a good energy food and help to meet the body's need for calcium and phosphorus. Their comparatively-high protein content, though not of the same quality as that of eggs or meat, makes them suitable substitutes for these foods. Iron, of which beans are a good source, is necessary to make blood, an insufficiency of which causes anaemia.

Beans should be sown in double rows 10in. apart with the seed placed diagonally 4 to 6in. apart and 2in. deep in the bottom of a trench 3in. deep. The soil should be moderately rich in organic matter such as compost, and if it needs additional fertilising, it

DRAINAGE OF THE HOME GARDEN



Left—Moraine drain using stones or shingle. Right—Scrub or brush drain: Scrub (manuka is suitable) is packed tightly in the bottom of a trench and covered with straw or similar material which will pack closely to prevent soil when returned to the trench from blocking the drain.

should be dressed with superphosphate at the rate of about 2oz. to the square yard. A very light dusting of potash or a dressing of wood ashes is often of value on heavy, wet land or where weather conditions are likely to be cold and boisterous. Initial cultivation should be deep and thorough.

Good varieties are Early Long Pod and Broad Windsor.

Peas, radish, turnips, spring onions, spinach, silver beet, lettuce: Except in favourably-situated gardens where soil conditions are good, sowing should be deferred until at least the beginning of July unless a frame is available. Seed of lettuce for spring use is best sown in a box, but the other vegetables should be sown directly into the frame, the soil of which should be light and well-drained, with well-rotted organic material such as compost thoroughly incorporated in it. Heavy soils can be lightened by the addition of sand, which is of no direct manurial value but which, by improving drainage and preventing the soil from caking, increases aeration and so enables the soil to warm more quickly and young roots to penetrate more easily.

Standing Crops

Spring and savoy cabbage and cauliflower should be kept weed-free and the soil between the rows as loose and free as the spacing of the plants will allow. In districts where humidity is high mildew is often troublesome and young cabbage plants should be sprayed with Bordeaux or a suitable Government-certified fungicide. Unless the soil is very rich spring cabbage and cauliflower will benefit from a weekly application of organic liquid manure or nitrate of soda at the rate of 1oz. to 2 gallons of water. Both cabbage and cauliflower should be kept growing vigorously without check; poor soil produces poor cabbage and may even cause the cauliflower to "button."

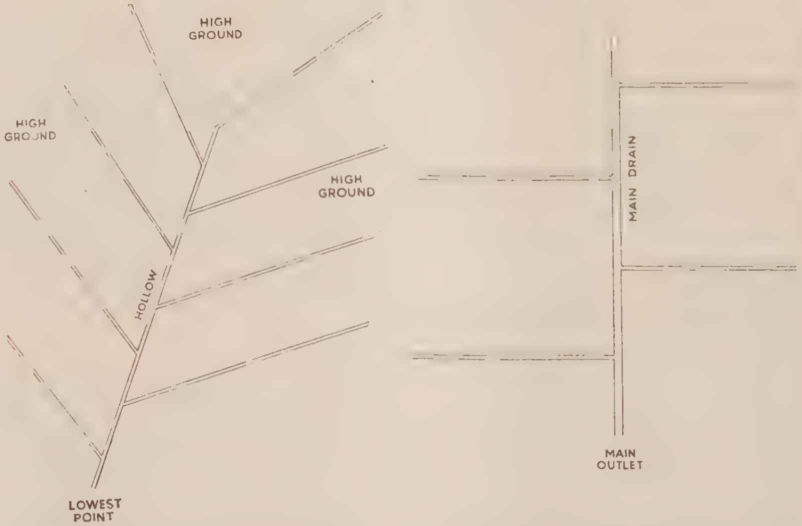
Where row spacing permits it is good practice to bank or earth up soil along the row against the stems of brussels sprouts or late-maturing broccoli.

Onion seedlings should be kept weed-free, as they suffer even more than most crops from competition with weeds. Poorly-developed plants will benefit from the application of liquid manure.

Endive

Plants set out in early autumn should now be ready for blanching. Only a few plants should be blanched at a time, as the blanched plants quickly begin to deteriorate. Blanching is done either by tying the leaves

DRAINAGE LAYOUTS



Left—Herringbone pattern suitable for draining a large area. The number of drains necessary depends on the type of soil, rainfall, or presence of springs. Right—System most commonly adopted in a fairly-level home garden.

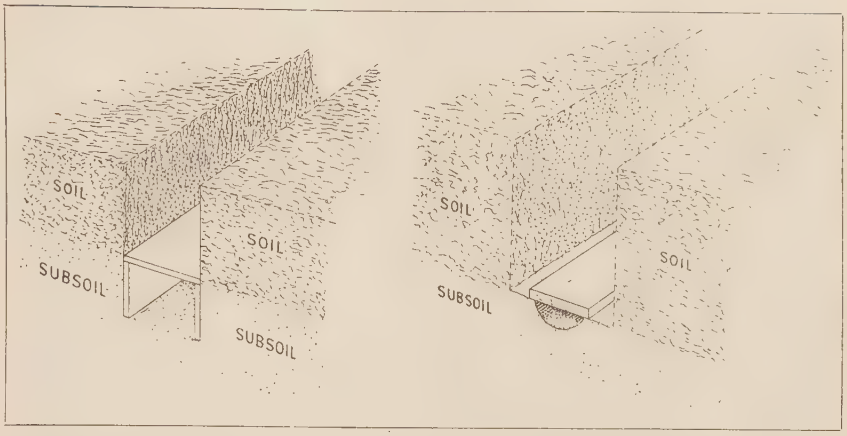
of the full-grown plant together at the top or by covering plants, particularly of the curled variety, when dry with a box or a pot with the drainage hole covered. Blanching usually takes three to four weeks and is necessary with full-grown plants, as otherwise they are rather bitter; the leaves of young plants may, however, be used for salads or cooked as a substitute for spinach.

Lettuce Diseases

Winter lettuce are subject to a number of diseases of which "grey mould" (*Botrytis cinerea*), "drop" or "rot" (*Sclerotinia sclerotiorum*), and "ring spot" or "rust" (*Marssonina panattoniana*) are the most serious. Grey mould is characterised by ashen-grey fructifications and drop by the development of copious white, fluffy mycelium. In both cases the mildewy growth and rotting are followed by the development of hard, black sclerotia or resting bodies, which should be gathered with the affected plant and burnt. Spraying with fungicides is of little avail in the control of these diseases, but hygiene, good drainage, and rotation are very important. Plants should be well spaced to provide for a good circulation of air and care should be taken not to damage them during cultivation. Seedlings affected with grey mould can sometimes be identified by red colouring on their bases and should be destroyed. Soil should be kept cultivated so that surface water drains away.

The first signs of ring spot appear on the main rib of the oldest leaves near ground level as slightly sunken, pale yellow spots. The lesions later turn brown and spread along the leaf stem, often splitting it open slightly to give the appearance of insect injury. Secondary infection of the leaves arises from spores produced from the stem lesions and appears as small brown spots which may coalesce to give irregular patches of dead tissue. Subsequently the dead areas fall away, giving the plants a ragged, shot-hole appearance. The disease spreads rapidly in the seed-bed and may cause the death of whole groups of plants. Plants set out in the field may be killed if infected early, but usually they remain stunted and are useless for the table. Ring spot should not be confused with a bacterial leaf spot that occasionally occurs on lettuce. The bacterial spots are deeper in colour, larger, and do not give rise to the shot-hole symptoms. Ring spot generally clears up with the advent of warmer weather. The severity of the disease can be reduced by spraying with Bordeaux or a suitable Government-certified fungicide, but for best results spraying should be commenced before the disease appears. Trials carried out by the Plant Diseases Division of the Department of Scientific and Industrial Research indicate that the first spray should be applied soon after germination and repeated at intervals of two to three weeks in the seedling bed and three to four weeks when set out in the field. Plants infected in the seed-bed should be dug out and destroyed. Rotation should be practised; lettuce should not be grown again for at least 12 months in soil on which an infected crop was grown. As ring spot appears to develop more rapidly where drainage is poor, raised beds are an advantage on poorly-drained land.

DRAINAGE OF THE HOME GARDEN



Left—Drain formed by placing two planks on edge and roofing them with a third at the bottom of a trench dug into the subsoil. Right—Drain made by covering with a plank a hollow scooped in the surface of the hard pan of the subsoil at the bottom of a trench the depth of the topsoil.

Potatoes

Though for most home gardeners June is rather early to prepare for planting potatoes, in well-situated gardens in favourable localities or even in some of the less-favoured localities where the home gardener is prepared to keep all new growth earthed up until danger of frost is over, seed potatoes may be selected and placed with the eyes up in trays in a light, airy, frost-free shed or outbuilding. Certified seed should be chosen because of its consistently-higher yield. Two classes of Certified seed are available, Mother seed and Commercial seed. Mother seed can be expected to yield the best results consistently, though Commercial seed is quite satisfactory unless recertification is sought. This aspect of production does not, of course, interest the home gardener, whose demands in quality and yield are met by Commercial seed. As potatoes degenerate rapidly, particularly in the warmer districts, because of virus diseases which are spread by aphides, almost all Certified seed is produced in the South Island, where the incidence of disease and its less rapid spread make the production of healthy stock less difficult. The average production from Certified seed for the years 1936 to 1943 was almost 2 tons an acre higher than that from uncertified seed, and later figures show Certified seed in a no less favourable light.

The production of well-formed sprouts is an important though not essential factor in success with early potatoes. Greened and sprouted potatoes are less likely than unsprouted tubers to be adversely affected by a spell of wet, cold weather after planting, particularly in poorly-drained soil, as they commence development at once, and the roots formed and resultant more vigorous condition of the tuber enable it to withstand the many soil-borne diseases, some of quite a minor nature, to which a less-vigorous plant may succumb.

When storing potatoes in sheds in districts subject to heavy frosts care should be taken to block up all cracks through which air at freezing temperature may pass. Potato tubers will withstand several degrees of frost for a little time and may not show internal or external injury, and tubers which have been frosted may sprout satisfactorily, but subsequent growth is likely to be weak and the yield below normal. In experiments carried out overseas tubers subjected to 1.8 degrees F. of frost for a period of 40 hours showed no external or internal injury, but the yield was significantly reduced.

An advantage of putting potatoes in trays to sprout is that any tubers that fail to sprout can be discarded, thus reducing misses to a minimum. When sprouting begins it is a good plan to turn the tubers, as this prevents the sprouts from becoming too long. Excessive sprouting reduces the vitality of the tubers and long sprouts are easily broken in handling, affording favourable conditions for the development of disease-producing spores.

Rhubarb

Unless the soil is particularly rich and fertile, it is not advisable to leave rhubarb for more than about 4 years without splitting the crowns and replanting. Crowns left too long without dividing tend to become hollow in the centres and send up numerous weak stalks instead of a limited number of stout stalks of the kind easily handled for cooking. Crowns of main crop or spring- and summer-bearing varieties to be divided can be lifted now without harm and left in a sunless, somewhat sheltered position until the buds begin to grow, when they should be split with a sharp spade and planted singly or in twos at least 2ft. apart each way. This work can be left for another month, or even longer in the south, but for best results should be done before the crowns recommence growth for next season.

HOME GARDEN SOIL STERILISATION . . .

Standing beds should be kept weed-free and will benefit from the incorporation of a liberal dressing of compost or farmyard manure around their roots.

Lime

Carbonate of lime should be applied at the rate of 2 to 3oz. a square yard to soils to which a good deal of organic manure or acid fertiliser has been applied, but in high-rainfall areas where lime is leached out of the soil more rapidly this amount can often be doubled. Home gardeners are frequently at a loss to know whether their soil needs lime. A number of methods of testing the soil are available. Probably the litmus or the hydrochloric acid tests are among the most reliable. With the litmus test if blue litmus paper when dipped into a paste of pure water and a mixture of soil from different parts of the area being tested soon turns red, the need for lime is indicated. With the hydrochloric (spirits of salts) or muriatic acid test soil is taken similarly from different parts of the chosen area to a depth of 9in. and mixed with a little pure water (rain water is suitable) to form a thick paste. A teaspoonful of acid is then added. If effervescence occurs, there is sufficient lime in the soil; if not, lime should be added.

Club Root Disease and Lime

Where club root disease has been troublesome rotation should be practised, and plants of the cruciferae family such as turnips, radish, mustard, swedes, cabbage, and cauliflower should not be grown on affected land. The disease may be satisfactorily controlled by the application of lime. Carbonate of lime is not recommended. Freshly-slaked burnt lime, hydrated lime, or ground quicklime is best and should be used at the rate of from ½ to 1lb. a square yard on the lighter soils; heavier applications may be necessary on heavier soils. There is a danger in applying such large quantities of lime to certain soils, as it may result in the "locking up" of minerals such as iron and manganese, which in turn may bring about deficiency diseases in certain crops. Lime is usually either scattered during digging or more commonly applied to the surface of the soil and allowed to wash in. Its effect, therefore, is not immediate, for it must be intimately mixed with the soil particles to be wholly effective. Eighteen months may be required for satisfactory results.

Soil Sterilisation

Because some time must elapse before sterilised soil can be used for sowing seed or growing plants, it is a good plan to make a start with sterilisation in June.

Few home gardeners have not had experience of seedlings damping off in boxes due to soil-borne diseases; those who grow tomatoes or cucumbers under glass will be equally familiar with troubles traceable to the condition of the soil. Most gardeners know that soil used for a number of years to grow the same kind of crop or crops requiring the same plant food and subject to the same diseases is likely to become "sick"—that is, its fertility will be impaired because of the increase in disease-producing organisms or the lack of certain plant foods or elements. Some improvement in crop-producing capacity can be brought about by heavy applications of organic manure, but organic manure in the quantity required is usually difficult to obtain and its manurial value is often unbalanced for the crop it is intended to grow. Such conditions may even be ideal for injurious organisms without the compensating virtue of producing the desired type of strong, balanced growth. Though outdoors the danger of recontamination and high cost where large areas are involved usually rules out the use of sterilisation, for the production of plants under glass or in seed boxes or frames the sterilisation or more correctly the partial sterilisation or disinfestation of the soil offers a solution to the problem. If properly carried out, soil sterilisation and certain forms of soil fumigation will destroy fungus, bacterial, or virus diseases together with injurious soil insects or animals and their eggs and most weed seed, without destroying or inhibiting the growth of the beneficial bacteria which are necessary for soil fertility.

[*Green and Hahn Ltd. photo.*

Green crops approaching the flowering stage or growing on land soon to be used for a crop should be turned under to rot. Above is a cover crop of barley.

Soil sterilisation as the term is understood by horticultural workers may be done in several ways: By some form of heating such as baking or steaming or by the passage of an electric current through it; by chemicals such as cresylic ("carbolic acid"), formaldehyde, chloropicrin, or carbon disulphide. Steam and the use of chloropicrin (a form of tear gas which is available under a proprietary name) are now generally accepted as being the most effective all-purpose sterilising agents, which are equally effective against disease and insects. Promising results, however, have also been obtained from several newer chemicals which are still being tested under field conditions in New Zealand.

Propagating soil to be sterilised should be friable and put through a ¼in. sieve. Glasshouse soil, too, should be in a friable condition to a depth of 18in. and free from lumps. Where eelworm is present the soil should be treated to a depth of 2ft. or more to eradicate the pest; sterilisation at such depths is, however, rarely practicable. Owing to ease of penetration and diffusion, light soils react better to sterilisation — particularly chemical sterilisation—than heavy soils, which resist penetration; for this reason failure is common with chemical sterilisation of heavy soils.

Formalin: Of the older chemicals formaldehyde was the most used, and though not a particularly good insecticide—it was not very effective against eelworm, though it reduced its attack—it was an effective fungicide for controlling soil-borne diseases. For sterilising glasshouse soils (more correctly termed disinfecting or fumigating where chemicals are used) formaldehyde (40 per cent.) is used at the rate of 1 gallon mixed with 49 gallons of water to an area of 15 square yards. Where disease has been severe the area could be reduced to 10 square yards. Application should proceed by simultaneously turning the soil and wetting it with formalin solution. The soil should be saturated and left for three to four weeks before planting. The glasshouse must be left empty, as the vapours will injure plants up to three and possibly six weeks later, according to weather or ventilation. For best results soil should be covered with wet sacks for a few days after application of the formalin. Heaps of soil can be treated by saturating 6in. layers with the 2 per cent. solution as the heap is built and finally covering the whole with wet sacks for 48 hours. Fifty gallons of diluted formaldehyde will saturate about 1¼ tons of soil.

Glasshouses; seed boxes: A 2 per cent. solution of formaldehyde can be

[*Green and Hahn Ltd. photo.*

If onions have been thoroughly dried off and then strung, they will keep well hung in a cool, dry, airy shed.

used as a good general disinfectant where diseases have been troublesome. The liquid should be washed or preferably sprayed with considerable force against all woodwork, soil bins, or other places likely to harbour the spores of disease. Used boxes can be washed first and should then be immersed for several minutes in a large container of the solution, after which they should be packed compactly and covered with wet sacks for 48 hours; later they should be stacked loosely to dry.

Cresylic acid: This is little used now; it is more effective against soil animals such as wireworm and eelworm, but is not such a good general steriliser as formaldehyde. Pale, straw-coloured cresylic acid 97 to 99 per cent. pure is diluted at the rate of 1 gallon to 39 gallons of water and dug in at the rate of 40 gallons to 9 square yards. More thorough sterilisation may be obtained by mixing as above and applying at the rate of 40 gallons to 18 square yards. This is dug in one spit deep and after about 8 days the top spit is turned upside down and a second application made at the same rate and dug in. Rubber gloves must be worn and care taken to ensure that the acid is not spilt on clothes. Small quantities of soil can be treated at the rate of 1 gallon of the prepared solution to 1 bushel (about an apple case full) of soil and covered for 48 hours as recommended for formalin. Treated soil may then be aerated by forking, or the spreading of small lots, and is ready after three weeks.

Chloropicrin: This is commonly known as tear gas and is a fairly effective soil fungicide. It also controls many weeds and is beneficial to plant growth. In glasshouses it is injected into the levelled, moderately moist soil either with a burette and dibble or with a specially-designed injector, at intervals of 10 to 12in. and at depths of 4 to 6in., according to soil and severity of disease. Dosages are from 2 to 4 millilitres (1 teaspoon = about 20 drops = 5 millilitres) per injection. The holes should immediately be sealed by dragging or pressing the foot across them and afterward a water seal of up to 1 gallon a square yard should be applied; wet sacks spread on the surface are also an advantage. Maximum results are obtained in 48 hours, but it is not safe to sow seed for a week or to plant out seedlings for a fortnight. Condition of the soil for planting can be tested by holding a sample to the eyes or nose; if a slight tingling or similar reaction is felt, planting should be delayed. Aeration can be speeded up by forking.

For sterilisation soil temperature should be 60 degrees F. or higher; below this the action is not so effective, particularly against weed seed. Below 45 degrees F. sterilisation should not be attempted. Moderately moist soil condition is best. The positions of the holes should be determined by the use of a board or line on which marks have been placed at the predetermined 10, 11, or 12in. intervals. The holes in each row should alternate so that when finished the lines of holes run diagonally.

One serious disadvantage of chloropicrin is that it does not penetrate plant tissue that has not rotted and it is not therefore very effective against eelworm, for it is not usually practicable after removing a crop to wait until all particles of plant tissue are properly rotted before applying the chloropicrin. Small lots of soil can be treated at the dosage of ¾ to 1lb. of chloropicrin to the cubic yard, though under suitable circumstances dosage may be reduced to ½lb. Heaps of soil should be covered with material such as wet sacks or wet newspapers after injection; treatment can be very simply carried out with the soil in bins, barrels, or boxes. Soil is placed in 6in. layers, over each of which a proportionate amount of chloropicrin is quickly poured and the next layer shovelled on. After the final layer the lid should be closed tightly. Soil should be moderately moist and should be watered a few days before if dry. Half a pound of chloropicrin to a cubic yard is equivalent to 5 millilitres a cubic foot. Care should be taken to avoid breathing in the fumes or spilling the liquid on skin or clothing.

The effects of most types of chemical sterilisation are somewhat similar to those obtained when soil is heated to 140 degrees F.—that is, the amount of ammonia is increased owing to the extermination of the organisms detrimental to the ammonifying bacteria.

Sterilisation by steaming: Steam sterilisation is recognised as the most generally satisfactory of all methods of sterilisation. Like all other methods, however, it must be done thoroughly. The steaming of commercial glasshouse soil is done by driving steam at pressure through systems of pipes or grids which are buried in the soil, trays laid on the surface, or harrows the hollow tines of which are forced into the ground. The temperature is then raised and held at 200 to 212 degrees F. for 10 minutes. Earthworms are killed at 130 degrees F. and most fungi at 170 degrees F.; the majority of virus diseases are inactivated at 170 degrees F., though temperatures must be raised to 194 degrees F. for some. (Virus diseases are not usually traceable to soil and sterilisation cannot therefore be relied on for their elimination in future crops.)

Insect and animal pests and weed seeds are all killed at 170 degrees F. if the temperature is maintained for 10 minutes. Few bacteria survive 140 degrees F. for 10 minutes, though the nitrifying bacteria are not killed until about 212 degrees F. (boiling point) is reached; ammonifying bacteria can withstand even greater temperatures, and for this reason steam-treated soils

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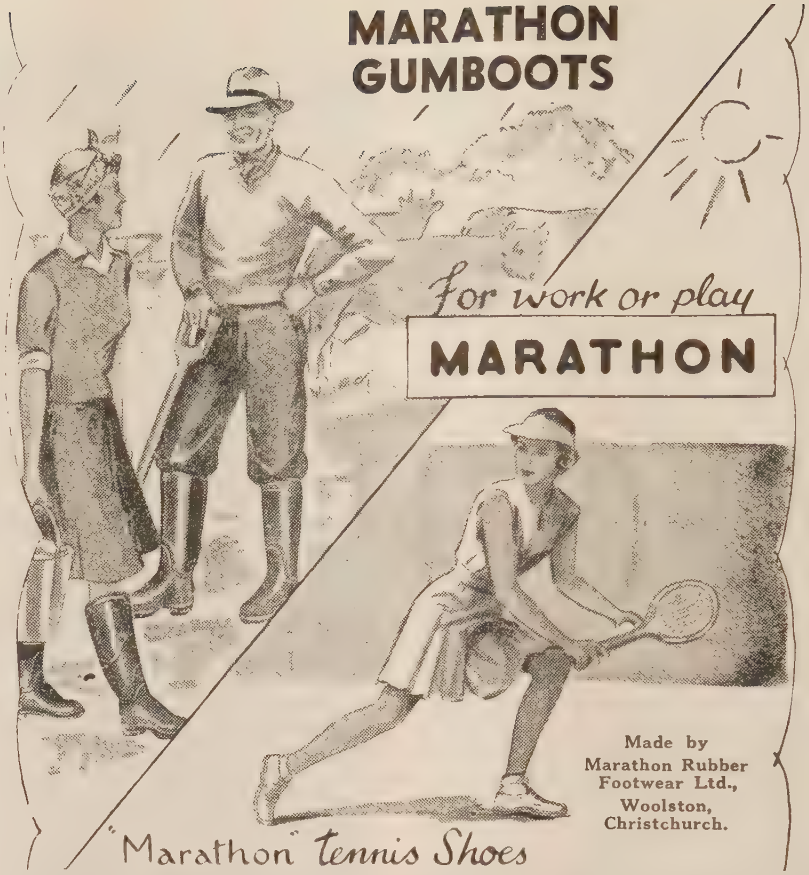

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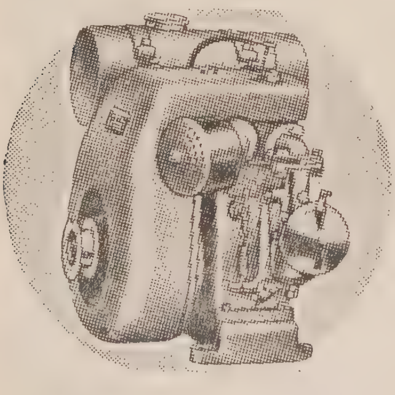

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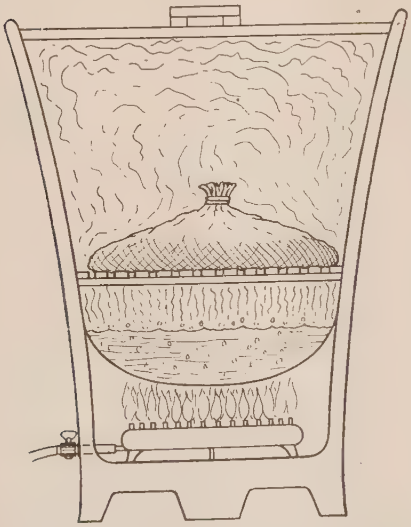
are usually unbalanced—that is, they are very rich in ammonia because at temperatures higher than 140 degrees F. organisms detrimental to the ammonifying bacteria are killed and above 212 degrees F. the ammonifying bacteria alone continue producing.

Excess ammonia may retard seed and seedlings and often results in undesirable soft, rank growth in plants due to the excessive nitrogenous plant foods available. For this reason steam-treated soils should not be planted for from three to six weeks. With certain exceptions the richer a soil is in organic matter the greater the amount of available nitrogenous compounds formed when it is heated above 130 degrees F. Retardation of growth due to excess ammonia, particularly with seedlings, was found (Lawrence and Newell, "Seed and Potting Composts") to be greatest when the organic matter and lime content was high and the phosphoric acid content low and conversely there was least retardation when the organic matter and lime content was low and the phosphoric acid content high. In the English experiments it was found that the addition of superphosphate to sterilised soil largely counteracted the retarding and injurious effects of soil sterilisation and it was better for seedlings and potting to use turfy loam (which was unlikely to be very rich in organic matter) than arable soils (which have usually had heavy dressings of organic material and lime) and when making potting compost not to mix either loam, leaf-mould, manure, fertiliser, or lime before sterilising.

The reason a delay of some weeks is recommended after steam sterilisation of glasshouse, seedling, or potting soil rich in organic material is to give the soil a chance to lose some of its nitrogen; the same effect can be achieved and the period reduced by the application of superphosphate to the compost when the soil is used for this purpose, by the heavy watering of soil heaps, or by the flooding of glasshouse soils.



Low-pressure soil sterilisation in a domestic copper requires rapid heating, and only small quantities of warm, dry soil should therefore be treated.

[*Sparrow Industrial Pictures Ltd. photo.*

Broad beans are one of the few vegetables which may be sown throughout the winter. Sown now they will mature when other vegetables are scarce and lacking in variety.

In the home garden the simplest way of sterilising soil is in the domestic wash copper. A sack, preferably a loose-woven one, containing a quarter of a bushel of sifted dry soil is placed (so that as large an area as possible is exposed to the steam) on a grating over 1 to 2 gallons of water as shown in the diagram on this page. The lid is replaced and with the fire red and drawing strongly the water should boil in about 10 minutes; after the temperature in the middle of the soil has been maintained at at least 180 degrees F. for 10 minutes it can be considered sterilised and removed from the copper to cool. Ideally in steam sterilisation the temperature should be raised to the sterilising point as rapidly as possible, maintained for as short a time as compatible with killing the harmful organisms, and then spread out to cool as quickly as possible. There is no advantage in exceeding the required temperature or prolonging the period of heating. Quantities of soil sufficient to fill a seed pan can be sterilised in a saucepan. Dust-dry soil is placed in a saucepan containing about ½in. of water; the water is heated rapidly until it boils and simmered for 15 minutes. The soil is then emptied on to a clean surface to get rid of excess moisture.

In all sterilisation it is important that the treated soil should not be permitted to come in contact with contaminated pots, boxes, water, or soil, as re-infestation from such sources will be much more rapid with sterilised than with unsterilised soil.

Baking: Because of the risk of "over-sterilising" (from a horticultural point of view) or killing all life in the soil, baking is not recommended for the home gardener without special equipment.

Electricity: Sterilising by electricity usually depends on heating soil by passing an electric current through it, but special equipment not generally available to the home gardener is required.

Radio Broadcasts

RADIO talks to farmers will be given from Station 1YA Auckland at 7.15 p.m. on the following dates:—

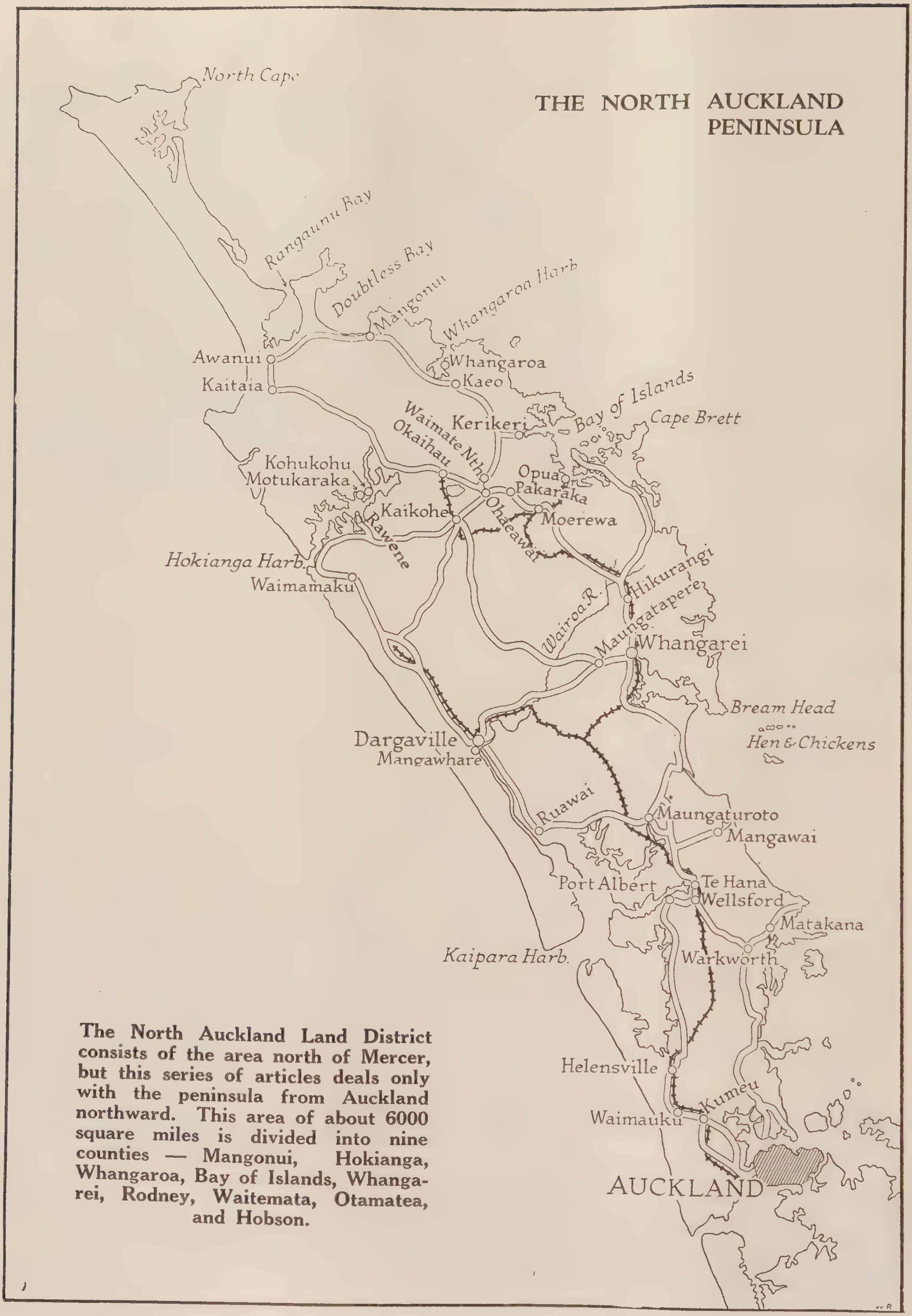
June 14—"The Work of the Fields Division Service Laboratory," by D. F. Waters, Senior Agricultural Chemist, Soil Fertility Research Station, Hamilton.

June 21—"Care and Management of Poultry Breeding Stock," by B. J. Russell, Poultry Instructor, Auckland.

June 28—Young Farmers' Clubs session, by the chairman of the Auckland Y.F.C. Council.

Other talks are given from 1YA Auckland on Tuesdays at 12.35 p.m., 2YA Wellington on Thursdays at 12.35 p.m., and 3YA Christchurch on Mondays at 12.35 p.m. and Thursdays at 7.15 p.m.

Farm news sessions are broadcast over main national stations every Thursday at 9.20 p.m.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Doubtless Bay
Mangonui
Whangaroa Harb.
Whangaroa
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Awanui
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Cape Brett
Waimate Nth.
Okaihau
Opua
Pakaraka
Moerewa
Kohukohu
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Rawene
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Wairoa R.
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Bream Head
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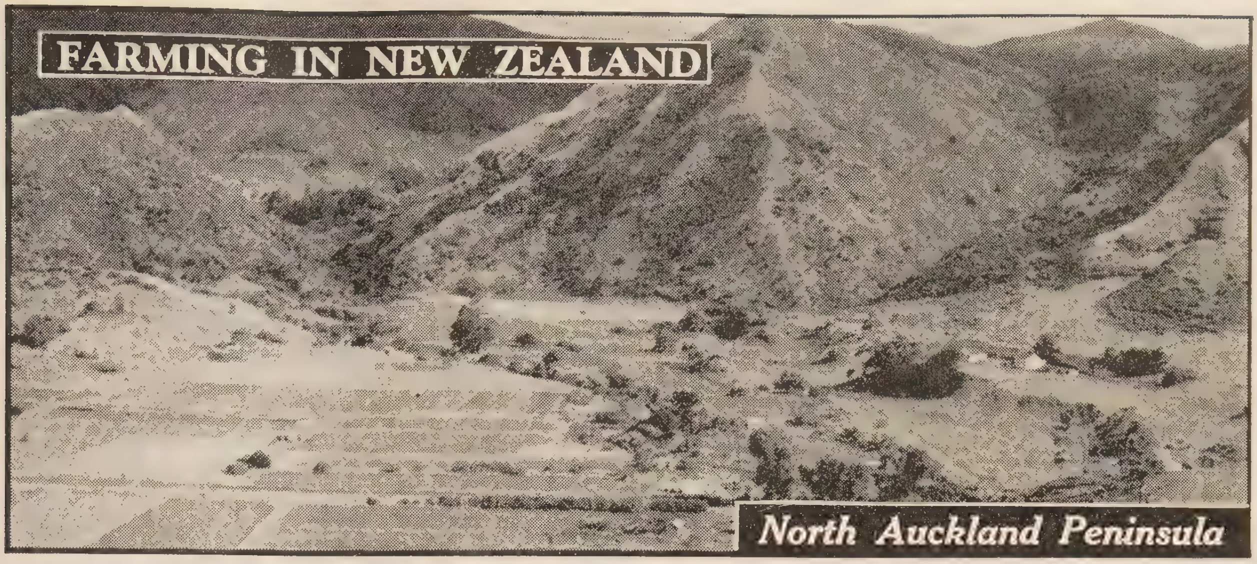
Dargaville
Mangawhare
Ruawai
Maungaturoto
Mangawai
Port Albert
Te Hana
Wellsford
Matakana
Kaipara Harb.
Warkworth
Helensville
Waimauku
Kumeu
AUCKLAND

THE NORTH AUCKLAND PENINSULA

The North Auckland Land District consists of the area north of Mercer, but this series of articles deals only with the peninsula from Auckland northward. This area of about 6000 square miles is divided into nine counties — Mangonui, Hokianga, Whangaroa, Bay of Islands, Whangarei, Rodney, Waitemata, Otamatea, and Hobson.

FARMING IN NEW ZEALAND



North Auckland Peninsula

NORTH AUCKLAND can claim to be the birthplace of farming in New Zealand, for it was there that the first plough was put into New Zealand soil. The first flour mill in New Zealand was also established there a little later by the missionaries. Though hindered until recent years by lack of metal roads and electric power, the district can be proud of its farming. The prolific grass growth, sponsored by a favourable climate and the response to lime and phosphates, makes it an ideal area for the production of primary produce, particularly butter, of which about 53,000,000lb. was produced for export during the 1946-47 dairying season, while the production of beef and fat lambs during the past two years has shown similar progress. This review of farming on the North Auckland peninsula, by E. B. Glanville, Assistant Fields Superintendent, Auckland, will be published in three monthly sections.

THE North Auckland Land District consists of the area north of Mercer, but this article describes the area north of the city of Auckland. The northern peninsula, as it is commonly known, stretches for about 200 miles north of Auckland and at its widest is not more than 60 miles. It contains an area of about 6000 square miles divided into nine counties—in the far north Mangonui, Hokianga, and Whangaroa; in the middle north Bay of Islands and Whangarei; in the lower north Rodney, Waitemata, and part of Otamatea; and the area commonly known as the Northern Wairoa consists of Hobson and part of Otamatea Counties, which lie adjacent to the large Northern Wairoa River. The population of North Auckland has increased considerably during the past 20 years and at present exceeds 80,000, including about 11,000 Maoris.

The variation of soil types in North Auckland is greater than in any other territory in New Zealand. It includes many thousands of acres of good dairying and fattening land, with large areas of second- and third-class grazing country, many acres of which require developing. Considerable tracts of gumland exist throughout the area, and a large block of undeveloped ironstone soil lies in Bay of Islands County. Many thousands of acres are fertile and flat, and rich volcanic cones are dotted throughout the area.

The topography of the land generally is undulating to steep and most of it was originally covered with dense forest. Kauri grew in abundance over a large portion of the area, while many large areas contained white pine, rimu, totara, or puriri forests. Consequently, the timber and kauri gum industries were the main activities of the settlers in the early years.

First European Settlement

North Auckland is renowned for the part played there in the early history of New Zealand's development by the European. The first European township was established in 1827 at Russell, where the seat of government was later located.

Settlers with ambitions to take up land in New Zealand began to arrive in North Auckland in 1852, and from then until 1860 a number of Scottish people landed at Waipu, emigrating from Nova Scotia. Later more settlers arrived from other parts of Europe, and settlements of these very desirable immigrants became established at Port Albert and Puhoi. The difficulties and hardships which those early settlers had to face in establishing themselves were tremendous, and the highly-productive farms of their descendants of today serve as great monuments to their industry.

The first main work which faced the settlers was to clear the forest, and consequently sawmilling was the most important industry in the early days. As the land was cleared farming developed, at first in a small way. The early settlers did not have artificial fertilisers to keep the fertility of the soil high, and as their pastures deteriorated it was necessary for them to clear more land and establish more grass areas on the new, rich bush burn. This type of extensive farming continued for years, and it was not until roads were formed, fertilisers became available, and farming methods improved that the system of intensive grassland farming now practised efficiently on a large proportion of North Auckland farming lands was practicable.

With the improvement of roading in North Auckland during the past few years and the installation of electric power throughout the peninsula, the task of developing further large areas of farming lands has been simplified. If adequate supplies of lime and phosphatic fertilisers are available, production of primary products from North Auckland will no doubt increase considerably and it may ultimately be one of the highest-producing areas in the Dominion.

The variation in soil types and the transport difficulties when settlers were turning their attention to farming resulted in very scattered settlement throughout the peninsula. As the waterways were the only means of transport, small settlements first sprang up near the harbours and tidal inlets so that the timber which was then being worked could be rafted down to Auckland. As farming developed, these settlements were not always in suitable positions for farming the scattered more-fertile soil types, but they still had to be used so that advantage could be taken of the existing water transport facilities.

Gradually as roads were formed further inland farming settlements

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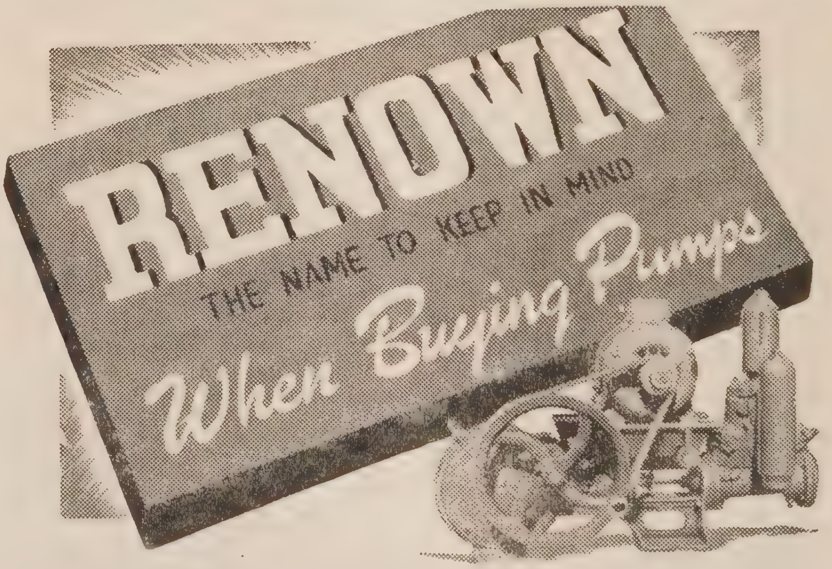

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sprang up, but they were still very scattered because of the large distances between the patches of fertile land. As roading improved those settlements grew larger, but scattered settlement still exists, as large tracts of land still await development even though the roading facilities are now good.

Climate and Soils

The climate of North Auckland is extremely mild, with few extremes of heat and cold, because of its close proximity to the sea coast on both sides and the absence of exceptionally-high country. Rainfall is heavy, and only in odd seasons is it not distributed evenly. It varies in different parts, but the annual average is about 45in., though in the higher country, such as at Tutumoe, it exceeds 100in. Snow is never seen in the area, and though frosts are experienced they are never very heavy and are not numerous. The climate is mild enough for grass growth to continue through the winter and is therefore ideal for grassland farming.

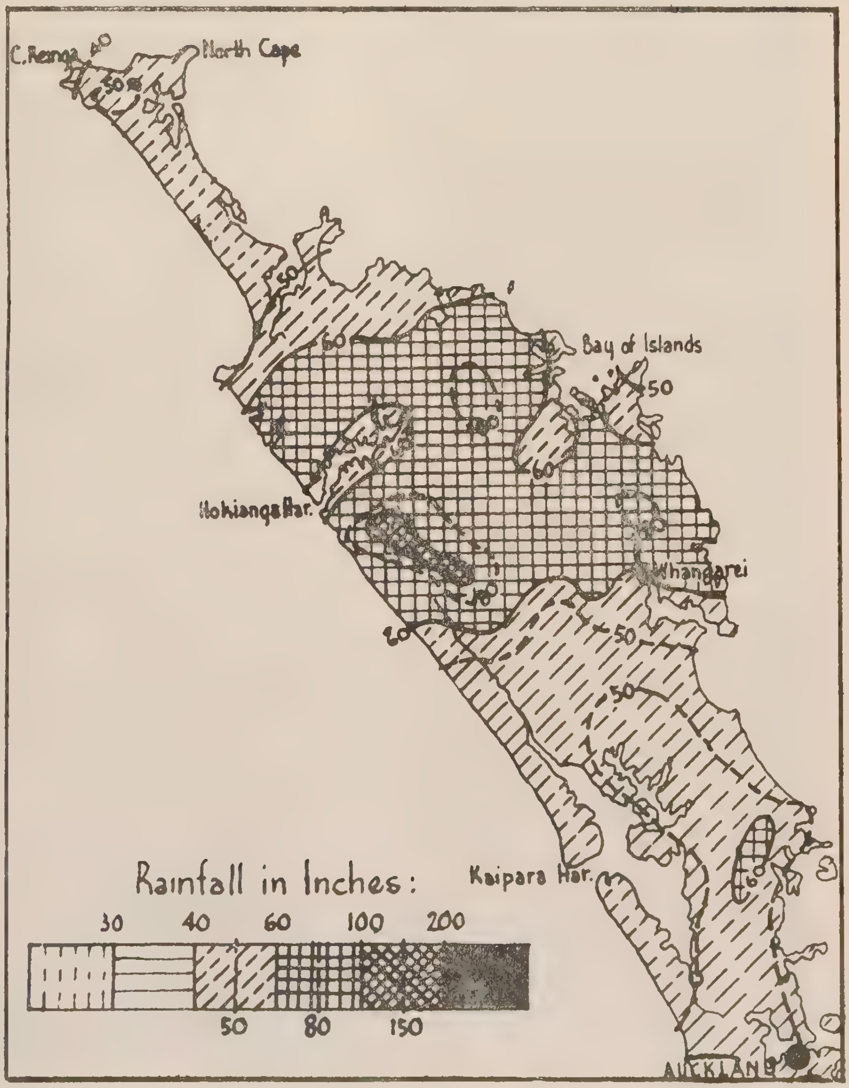
The soils of the peninsula vary considerably—from first-class, high-producing, rich alluvial flats and volcanic cones to poor, scrub-covered, leached clay, sand, and ironstone areas. Large areas of poor, leached soils await development. It is quite common to find several soil types on one farm, and some of the richest and most fertile soils are adjacent to some of the poorest and most infertile. Many of the poor, leached soils were originally covered with kauri forest and the trees left the soil exhausted. Gum diggers in search of kauri gum after the forests were cleared left the surface on many areas in a very poor state for agriculture. Thousands of acres lay barren and unattractive for years, and though development work has progressed, many large blocks are still in that condition. Not until roading conditions improved, enabling more economical transport of lime and artificial fertilisers, could any real development work be undertaken. With improved farming methods, lime and fertilisers, and Certified strains of grass and clover seeds, the grassing of most North Auckland soil types does not now present any great difficulty. There are, however, problem soils in the peninsula—a fairly-large tract of ironstone country, the mature sand areas, and some isolated areas of peat.

Undeveloped Scrubland

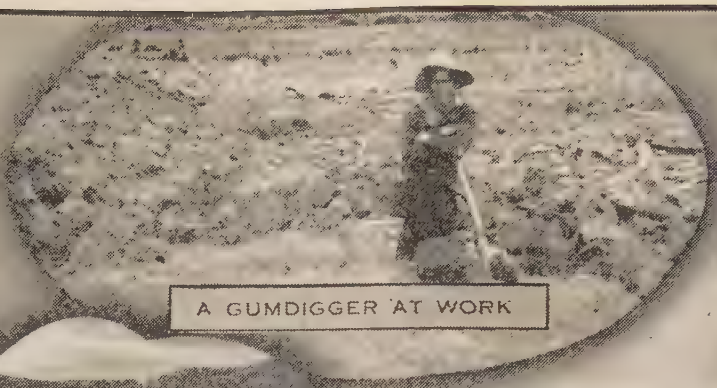
Much attention has been paid in recent years to the development of the gumland areas of North Auckland, and a large proportion of them has been taken up for farming. These soils are estimated to cover 1200 square miles and have been classified by the Soil Survey Branch of the Department of Scientific and Industrial Research into six broad types, of which three can be developed and farmed successfully. They consist of easy rolling country containing about 200 square miles of silt loam, 190 square miles of sandy loam, and 250 square miles of clay gumland. The remaining area of 560 square miles varies from rolling to moderately-steep and consists of about 200 square miles of mature sand gumland, 260 square miles of poor clays related to gumland clays, and 100 square miles of poor gumland hills. The last-mentioned three gumland soil types present difficulties for development and are unlikely to be used for farming to any extent.

In the early stages of development it was not thought possible that even the better-type gumland soils would carry a good sole of high-producing grasses and clovers. Unfortunately in most cases the areas under development were too large, many of the settlers had little or no capital, and in a great number of cases their farming experience was very meagre. Poor cultivation, poor strains of grasses and clovers, late sowing, inadequate phosphatic topdressing, and lack of cheap lime resulted in poor, low-producing pasture swards consisting mainly of browntop, danthonia, and *Lotus* species with little or no white clover and perennial ryegrass.

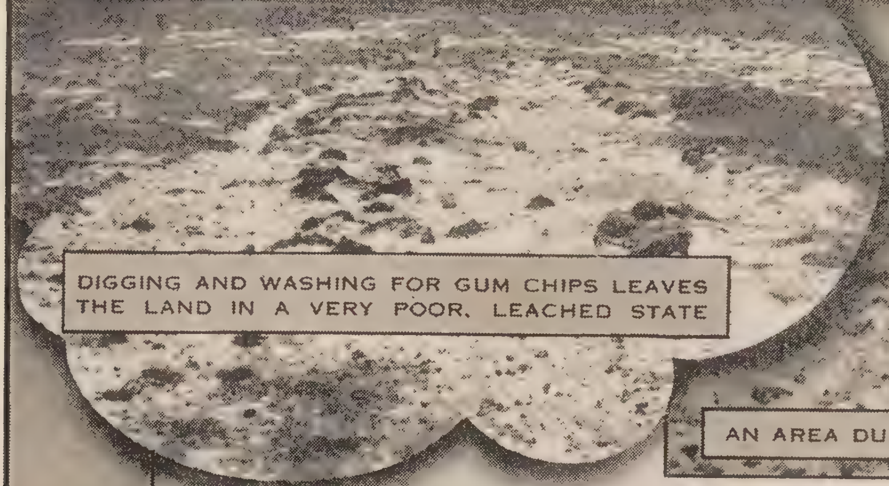
In the early days of development gumland was not expected to carry a good perennial ryegrass-paspalum-white clover sward. Early methods of development aimed at first raising the soil fertility by ploughing in green crops, tile drainage, subsoiling, and the use of burnt lime; that procedure was very costly and did not give satisfactory results. Experience has shown that the growing of field crops on gumland does not pay as it does in the development of better-quality soils, and crops such as turnips or rape cannot be used to any advantage. The building up of humus in these leached soil types by growing such crops as blue lupins or *Lotus hispidus* for ploughing in, once thought essential, is not necessary. When settlers were working along those lines no Certified seed was available and freight charges on fertilisers and lime were excessively high because of poor roading. Poor strains of grasses and clovers were sown, little or no lime and phosphatic fertiliser was used to feed the young pasture, and the type of cultivation adopted was not usually thorough enough to bring about conditions suitable for the establishment of a good



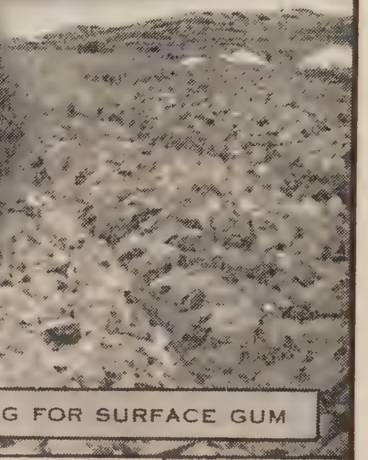
THE GUMLANDS OF NORTH AUCKLAND



A GUMDIGGER AT WORK



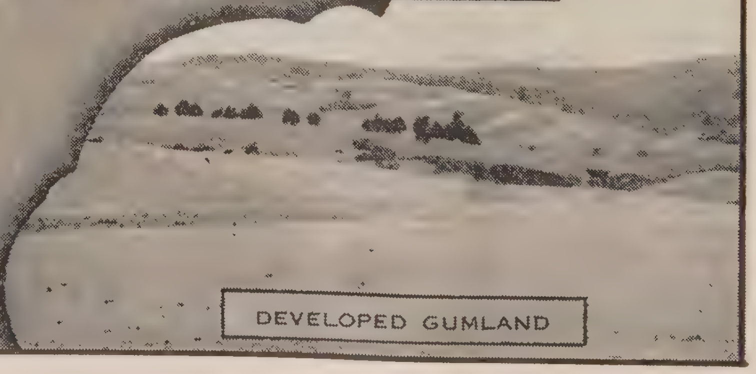
DIGGING AND WASHING FOR GUM CHIPS LEAVES THE LAND IN A VERY POOR, LEACHED STATE



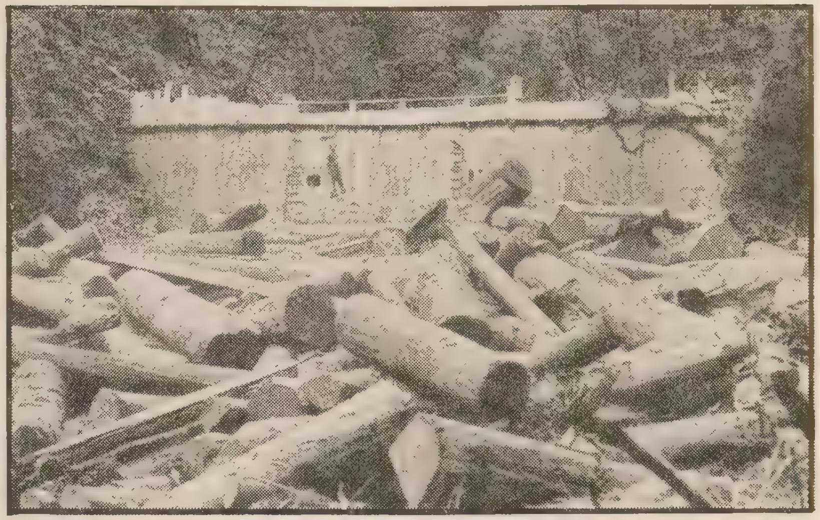
AN AREA DUG FOR SURFACE GUM

GUM CHIPS FROM SURFACE-DUG AREAS

In the wake of the kauri forests another rich harvest was reaped — the gum left by the trees. But digging and washing for gum left the land very difficult to develop for any other purpose.



DEVELOPED GUMLAND



[*State Forest Service photo.*

The early settlers' first main work was to clear the forest, so sawmilling became the most important industry. Logs from the mighty kauri forests were hauled into the bed of a river, which was dammed to await the first flood, which, on the dam being allowed to collapse, would carry the timber away. The man in the centre shows the size of the logs.

pasture sward. With such methods a poor, open, weak sward established, rapidly reverting to danthonia and browntop, with manuka ultimately taking possession again.

Because of previous experience methods have changed markedly. Settlers are concentrating on the development of smaller areas, on which it has been shown that the successful development of gumland depends, so that all the work in the establishment of a good pasture sward can be accomplished. Early ploughing, followed by a summer fallow and ploughing again in the late summer, early-autumn sowing with Certified strains of grasses and clovers, and the use of adequate lime and phosphate ultimately bring about the good, high-producing swards which are now present on many gumland farms.

Problem Soils

Considerable areas in the peninsula have soil types known as problem soils; these are mainly the ironstone soils and some of the peaty soils.

The ironstone type is a mature soil derived from basic igneous rocks, and Bay of Islands County has a considerable tract of this country. This scrub-covered land lies very attractively, is easy to rolling, and is well watered with natural streams. It is a very light soil type riddled with ironstone pellets and is very acid, responding to heavy dressings of lime and phosphate. Though pastures can be established on this soil, the better pasture species such as perennial ryegrass, paspalum, and white clover make little growth and production from them is very low. Grazing pastures do not progress satisfactorily unless they are treated with cobalt, and without it mortality is often high, especially in sheep.

The problem with the peaty soil types is mainly to drain them without overdraining to prevent them drying out too rapidly. Until recently it was difficult to hold stock satisfactorily on this soil type because of the disease known as peat scours, which caused high mortality. With the recent discovery that this trouble is caused by a deficiency of copper, stock can now be grazed quite satisfactorily on the consolidated areas if a small amount of copper sulphate is used with the fertiliser when pastures are top-dressed.

In addition there are some areas on the peninsula which are unsuited to farming, mainly the eroded claystone hills and mature sandstone country.

Water Supply

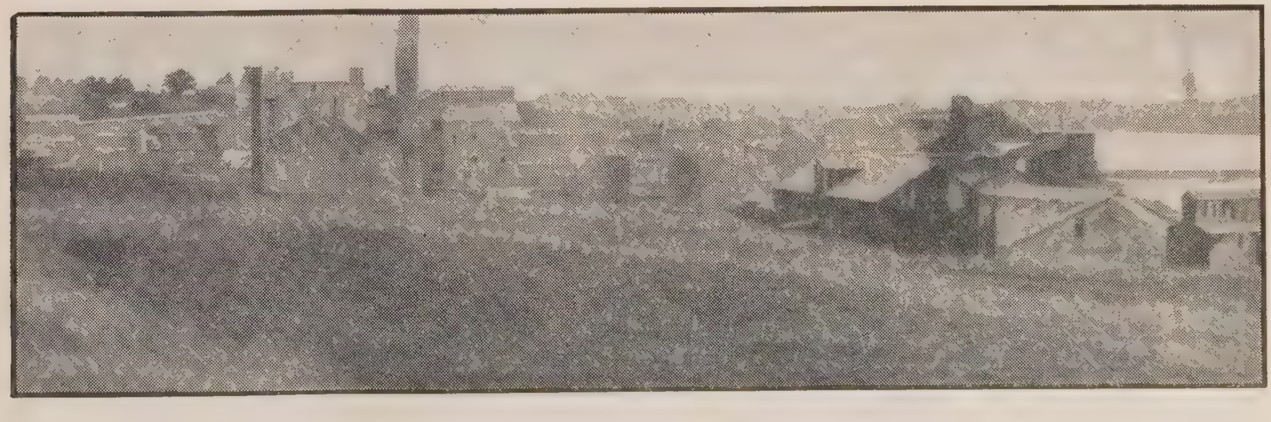
One of the drawbacks to development on the peninsula is the lack of a good water supply on some of the large tracts. Whereas the soils of volcanic origin in general have a good, natural, permanent supply, the gumland and limestone areas are poorly supplied.

As satisfactory bores cannot be sunk on many farms, dams must be built to hold water over from the winter. In many cases, such water is anything but good, and if the dams are not protected from stock, it soon becomes filthy.

Erosion

Because of the high rainfall, the erosion of hill country on the peninsula is a problem which must be faced. Though it has not yet reached serious proportions, it is noticeable in some of the hill-country areas. If the pasture cover is allowed to become poor and open, erosion is initiated by the removal of the topsoil by sheet erosion. That is followed by shallow slipping induced by the high rainfall, and the destruction of the pasture cover is completed by channelling of the slipped ground. The soils of the hillsides were formerly in balance with the forest cover, but as soon as that was removed and the surface cover of litter destroyed erosion began.

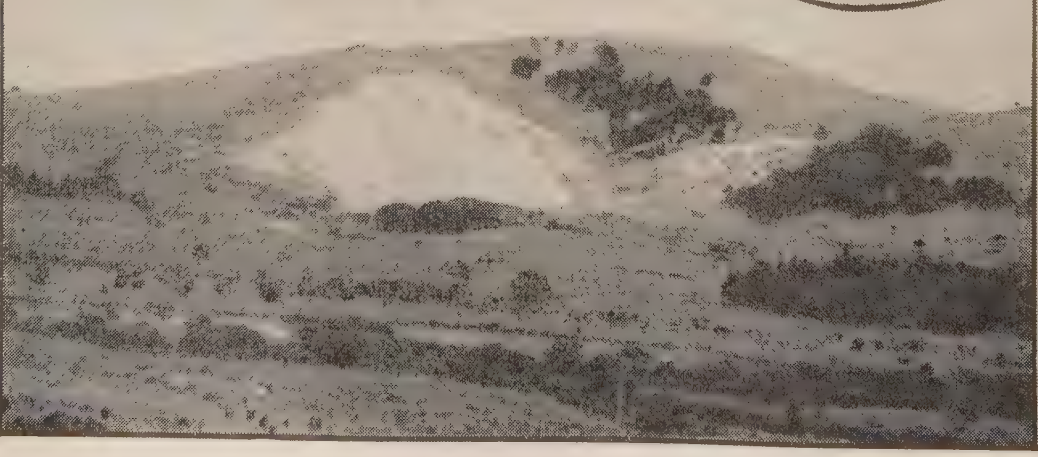
It can be arrested to a large extent by maintaining a tight pasture cover, but many of the swards are open, and overgrazing and constant burning of second



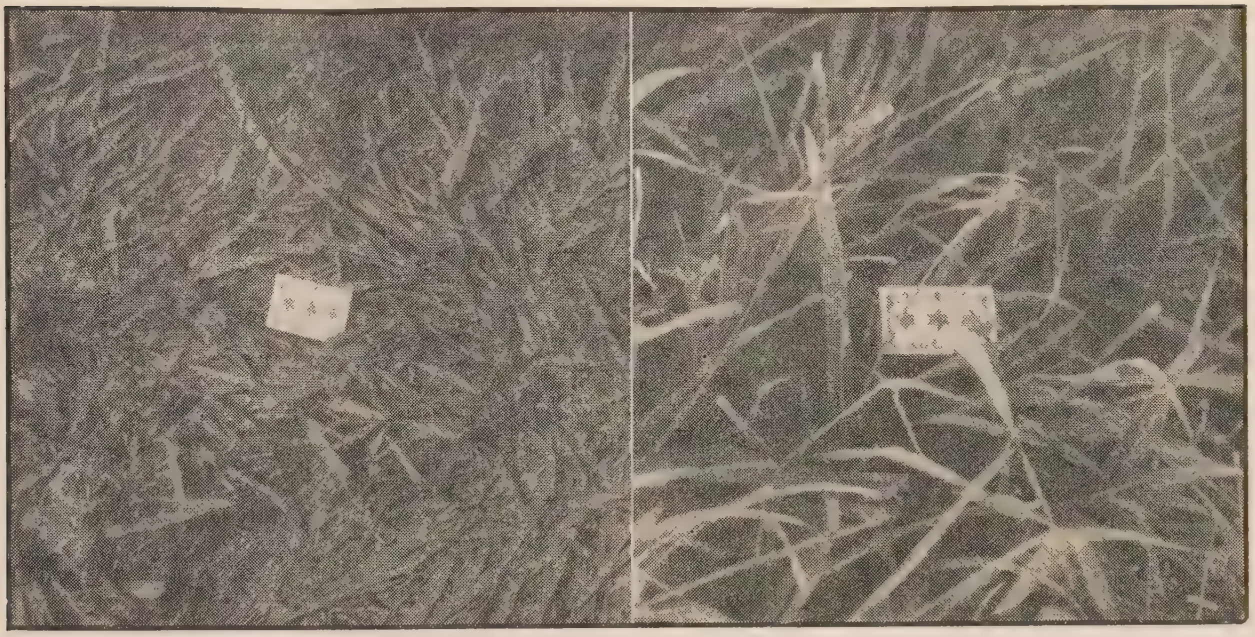
Among modern industries these cement works at Portland, near Whangarei, have made their place of manufacture known throughout New Zealand for their product of that name.

MAINTAINING FERTILITY OF NORTH AUCKLAND LAND

The wealth of the North Auckland farmlands depends on what comes out of the topdresser, as most of the soils are strongly leached and few respond to superphosphate in the absence of lime. At the left is a serpentine quarry and below a lime quarry in the peninsula.



PASPALUM IN THE NORTH AUCKLAND PENINSULA



Paspalum is a great coloniser. Left—Plants a foot or more apart meet in a few years and cover the ground with a dense sward. Right—A close view of the strong, palatable paspalum growth which occurs when the pasture is controlled by grazing or mowing.

growth intensify the condition. To prevent erosion from becoming a serious problem on the peninsula it is necessary to build up a stable grass soil on the hill country and to protect it from deterioration by proper control of grazing and topdressing. Topdressing helps to tighten up the pasture sward, but many difficulties attend the topdressing of steep grazing land, and the assured return to the farmer is not such as to tempt him to do this on a large scale. Much of the hill land has been cleared and grassed in the past without thought about what the next step will be. Care and skill are required to maintain permanent pasture on what was once a forest slope.

Value of Paspalum

A very important part in the development of North Auckland grasslands has been played by paspalum, and the high feed production of this pasture plant has been responsible for the output of primary products reaching such a high plane. Of several introduced species of paspalum, one (*Paspalum dilatatum*) has proved of outstanding value in North Auckland. This is the grass commonly known throughout New Zealand as paspalum.

Early records of the introduction of this grass to New Zealand indicate that it was first located in the Northern Wairoa district about 1893. It has been said that a farmer near Dargaville obtained a small packet of seed about that time from the captain of an Australian timber ship which travelled regularly up the Northern Wairoa River. He found that it established successfully on the river flats and was a wonderful summer feed producer. Records also show that an Auckland nurseryman obtained a packet of seed from Florida in 1892 or 1893. The plants were exhibited by a seedsman in Queen Street, Auckland, in 1894 and seed was sold at 1s. a packet containing about a dozen seeds. By 1895 small quantities of Australian seed could be obtained from several Auckland seedsmen, and during the next five years paspalum was introduced to most districts in Auckland Province.

Paspalum dilatatum is a sub-tropical grass which thrives on the warm North Auckland peninsula with its high rainfall. It is a strongly-growing, deeply-rooting perennial, and its main growth is made during the summer. The plant develops short underground rhizomes, and when individual plants are established a foot or more apart they will meet in a few years and cover the ground with a dense sward. Paspalum will survive fairly-long periods of inundation, and therefore is valuable on the fertile swamplands which are subjected to winter flooding. It is a splendid summer feed producer on land which lies too wet in winter and too dry in summer to grow a ryegrass-dominant sward. It is a good coloniser where climate and soil favour it and has gradually invaded the better-class hill country, swamplands, and river flats throughout the peninsula.

As a pasture grass paspalum has disadvantages, but it can be claimed that the advantages far outweigh them. The management and utilisation of paspalum pastures have forced farmers to develop methods which have brought out more prominently the many excellent qualities of this grass. The disadvantages attributed to paspalum, such as the smothering effect on other pasture species, the shortage of winter and spring feed, root binding, and falling off in production, have in more recent years been recognised as really faults in management.

The outstanding feature in the better management and utilisation of paspalum is that practically all the other species a farmer would like to have in his pastures can be established and maintained with paspalum. The management necessary for that is exactly what is required to get the most from the paspalum as a summer feed producer. Perennial ryegrass and white clover on land capable of supporting these species, either sown in the original mixture with paspalum or introduced later by surface sowing, can be maintained indefinitely. The growth period of perennial ryegrass is much earlier than that of paspalum, allowing this high-producing grass species to provide the winter and early spring feed. White clover is very necessary in a pasture sward of this description, as with ryegrass it combines well with paspalum, growing over and among the crowns and providing the paspalum with much-needed nitrogen.

The ideal pasture sward for North Auckland dairying land is one dominant in perennial ryegrass and white clover and also containing paspalum. Such a sward can be achieved and maintained only under fertile soil conditions and provided that the paspalum is prevented, either by stocking or by mowing, from growing rank and coarse year after year. With topdressing, controlled grazing, and the use of the mower, many thousands of acres of dairying land are now growing this pasture combination. The perennial

[National Publicity Studios photo.

Typical coastal dairy country in the Whangarei district.

ryegrass and white clover produce a winter and early-spring growth so strong that no paspalum is visible, and as the ryegrass growth diminishes in the summer paspalum becomes dominant in the sward and, with white clover, produces feed through the rest of the season. It is not uncommon for farmers to take two good cuts of hay or silage in one season from pastures of this description. The herbage of the first cut, taken in late October or early November, is perennial ryegrass and white clover; the second cut, taken in January, consists of paspalum and white clover.

A more general recognition of the facts that paspalum can be controlled, that other useful species can combine with it, and that all-the-year-round pastures can be obtained in North Auckland by the use of paspalum with other species is likely to extend the range of usefulness of paspalum far beyond its present limits.

Lime Requirements

Lime plays an important part in the topdressing of North Auckland soils in conjunction with phosphatic fertilisers. Most of the soils of the peninsula are strongly leached and low in replaceable bases, and it is necessary to supply lime in the form of ground limestone where that can be done economically, or to use basic phosphates such as basic slag, basic superphosphate, or rock phosphate on country where liming is not economic.

Another feature of some of the soils of North Auckland is their power to fix soluble phosphates which they possess in a moderate to high degree. Few of the soils respond well to superphosphate in the absence of lime, so the periodic dressings of limestone required are governed not by the rate of leaching of lime but rather by the amount of superphosphate topdressing carried out.

Most of the soils on the easy and rolling land suitable for dairying and fattening have a high lime requirement. On an average they require an initial dressing of from 5cwt. to 1 ton of ground limestone, followed by periodic dressings equivalent to 2cwt. an acre a year.

The steeper hill country also requires lime, but because of greater difficulties of application much less is used. The position is met, in part at least, by using basic slag and other basic phosphates.

Dairying Predominates

The climate and soils of North Auckland are more generally suited to dairy farming, and though a considerable quantity of wool and meat is produced, dairying is the main type of farming. Seventeen co-operative butter factories and one cheese factory are operating in the area, but only one meat works, a large porportion of the fat stock being slaughtered in Auckland works.

During the past 20 years the production of butter has more than doubled. In 1927 the total tonnage of butter was little more than 10,000, and production for the season up to March 31, 1947, reached 23,000 tons. Production of cheese has increased only slightly during the 20 years, rising from 107 tons in 1927 to 170 tons in 1947.

Production of meat has also increased, and during the past nine years more cattle, sheep, and lambs have been killed at the Moerewa works. Wool produced from the area has increased correspondingly. A little fruit growing and market gardening is carried out, mainly near Auckland City and at Kerikeri, in the Bay of Islands.

The area of occupied land north of Auckland City is about 2,600,000 acres; 1,350,000 acres are in grass, of which fewer than 600,000 acres are topdressed. Little more than 5000 acres are cropped each year, consisting of small areas of greenfeed and roots, grown on most farms for supplementary feed, and a small amount of maize grown for grain on suitable areas, mainly for pig feed.

Though North Auckland was the earliest settled place in New Zealand, agricultural development has been much slower than in other parts of the Dominion. That can be attributed to the great amount of work entailed in handling the vast areas of valuable timber which covered the land. Sawmilling was the main activity of the settlers in the early days, and the kauri gum industry was another means by which they gained revenue. Road access to the north was very poor and water transport had to be used, so settlements first sprang into being near the tidal inlets and harbours along the coast. Later roads were formed, and as the forests were cleared the settlers turned their attention to farming.

Dairy farming predominates in the Northern Wairoa district, which for the most part consists of gently-undulating hill country and fertile river flats.

Inoculation of Lucerne Seed

By **A. E. LYALL,** *Technical Assistant, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland.*

INOCULATION of lucerne seed in New Zealand has long been recognised as essential for successful establishment of the crop. Before 1928 the majority of fields intended for lucerne were treated with soil from an established crop to provide necessary organisms for nodule development. In 1927 the wet-culture method was introduced as a simpler, cheaper, and more efficient method of providing the nitrogen bacteria. It is simpler in that application of a small amount of culture to the seed requires very little labour or time; it is infinitely cheaper to buy culture at a cost of about 1s. an acre than to buy, transport, and broadcast large volumes of soil, and it is more efficient because wet cultures supply many more viable organisms and of a type selected for their value in promoting plant growth.

IN the first few years of culture distribution a few cases of poor crop establishment occurred, nodule formation being poor or negligible. An investigation showed that if soluble fertilisers came into contact with inoculated seed, the nodule bacteria were killed. That was confirmed by field trials, and since then farmers have been asked not to mix inoculated seed with superphosphate (including serpentine superphosphate), nitrate of soda, sulphate of ammonia, blood and bone, or potash fertilisers. Superphosphate may be used if first mixed with an equal quantity of ground limestone.

If proper attention is paid to the inoculation of the seed, failure to establish can be attributed to some other cause.

The original culture used in New Zealand was derived from an exceptionally-vigorous crop on mining tailings near Alexandra, and all subsequent isolations have been obtained from crops inoculated with cultures from this source. It appears that the original isolation was a highly-efficient strain and that with continued distribution of this strain little variation can now be expected. Though other cultures are tested periodically, none has been found that is better than this one.

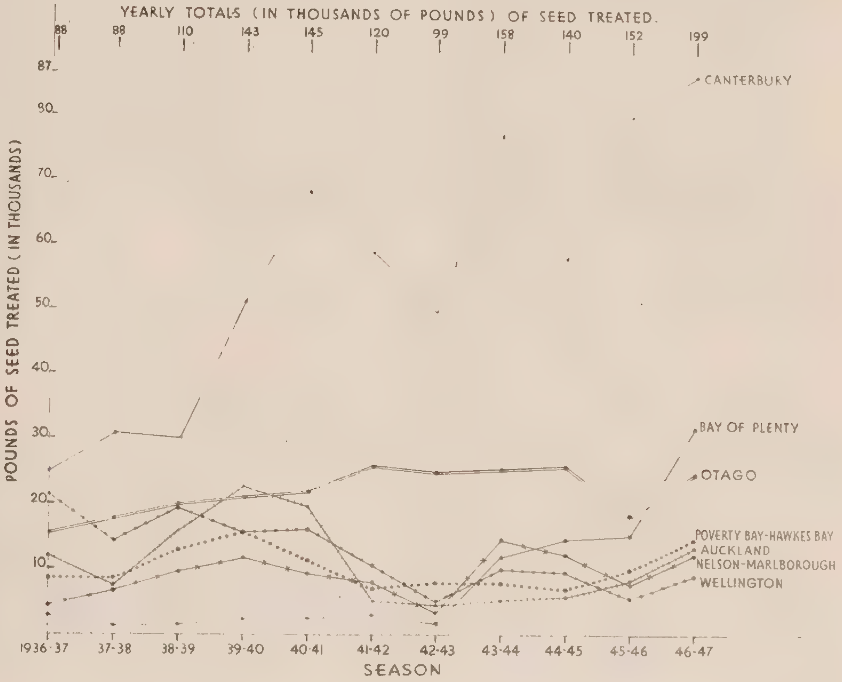
Since 1928 the use of cultures for lucerne inoculation has increased continually and gradually. In 1928 culture was supplied for about 7000lb. of seed; during the 1946-47 season sufficient for 198,838lb. was distributed to farmers. That increase can be attributed to a wider use of culture for establishment and to increased sowings of lucerne. In 1927 the area in lucerne was 27,780 acres and in 1946 it was 41,000 acres. Sufficient culture for 10,000 to 13,000 acres is now being supplied each year, a quantity obviously greater than is necessary for the annual increase in area. It would appear that replacement of run-out or weed-infested areas absorbs the greater portion of culture distributed.

The amounts of culture used in different districts vary considerably, but over a period of years the proportion in most districts has remained remarkably constant with exceptions in Bay of Plenty and Canterbury; South Canterbury demand has shown a steady increase over that of North Canterbury. The following records of pounds of seed treated in the 1944-45 season are typical of the annual district requirements of the past 11 years (districts are grouped in provinces or well-defined geographical areas): North Auckland 735, Auckland 1670, Waikato 3740, Bay of Plenty 15,900, Poverty Bay 2270, Hawke's Bay 5320, Taranaki 1050, Wanganui 1790, Manawatu 5200, Wellington 820, Wairarapa 2800, Nelson 6970, Marlborough 6400, North Canterbury 21,850, South Canterbury 36,700, North Otago 8500, Central Otago 17,800, Southland 330.

The distribution of culture, in terms of seed treated, during the past 11 years is given in the graph below, which shows that the increase in the use of culture has occurred largely in Canterbury and to a less extent in Bay of Plenty. In other areas the demand has been more or less regular, with a slight increase in Otago, Nelson, and Marlborough and a small decrease in Wellington Province; decreases have occurred mainly in the dairying districts of Waikato, Taranaki, and Manawatu.

In the 1941-42 and 1942-43 seasons there was a marked decline in the use of lucerne culture, no doubt caused by a reduction of sowings in the first two years of the war. This drop is apparently associated with a reduction in total area from 45,000 acres in 1943 to 41,000 acres in 1946. Since 1943 culture has been used more extensively in all districts and it is probable that the peak area of 45,000 acres of lucerne will shortly be exceeded.

Cultures for lucerne inoculation may be bought from any seed merchant or direct from the Plant Diseases Division, Department of Scientific and Industrial Research, Private Bag, Auckland. For convenience of growers cultures are supplied in different-sized bottles according to the amount of seed to be treated. When ordering culture the amount of seed in pounds to be treated should be stated. The minimum amount supplied is enough to treat 30lb. of seed, and the cost is at the rate of 2s. 6d. for every 30lb. of seed. Culture for treating quantities of up to 1000lb. of seed can be supplied by return mail, but for larger quantities a fortnight's notice is requested.



FARM WORK FOR JUNE

By the Fields Division.

WINTER PASTURE MANAGEMENT

Grazing: In most districts, especially in the south and at higher elevations in the north, normal grazing pastures have entered their dormant growth period by June. The quantity and quality of feed they offer at this time is largely dependent on the seasonal climatic conditions of the preceding autumn and the grazing management, topdressing, and cultivation treatments received during that earlier period.

Where pastures have been hard grazed in autumn or the soil is prone to pugging under intensive stocking during winter months care must be exercised to avoid overstocking during the normally-wet and dormant period. Otherwise permanent injury to the sward may arise either from the close, continuous defoliation of pasture plants at a time when they make little if any growth recovery, or by the breaking and opening up of a close-knit sward as a result of excessive pugging, which allows the subsequent ingress of weed competition. Swards given heavy and continuous grazing during winter fail to respond early in the following spring and their production of herbage in the succeeding growing period is endangered. The grass components of a sward are prone to suffer from over-grazing in winter, which is likely to lead to swards heavily infested with weeds, or, at best, clover-dominant swards.

Pastures entering the winter with little growth and not due for early renewal should receive lenient grazing with frequent spelling until spring growth is well under way. This can be done only where there is an alternative supplementary fodder crop or special grazing areas. It is therefore necessary to make ample provision for supplementary winter feeding and to adopt the sound practice of starting to use the supplements before, and not after, the permanent grazing swards have reached their dormant period.

Young, establishing, autumn-sown pastures should be grazed at intervals for short periods by high stock concentrations rather than for prolonged and continuous periods by a few head of stock. Light cattle or young sheep are preferable on such area.

RENOVATION OF PASTURES

The use of a selected area for feeding out well-seeded hay is a good practice, providing the soil is not likely to become "puggy" under concentration of stock. A sward becoming thin or even one retaining a fair proportion of better-class grasses and clovers but free of strong weed growth is suitable. Pastures seriously affected by an autumn attack of grass-grubs can often be conveniently and cheaply rejuvenated in this way.

WINTER LIMING

Generally little is gained by applying fertilisers, with the exception of the slow-acting phosphates such as basic slag, during the early winter, but where weather and soil conditions permit lime can be applied with advantage. On lime-responsive soils (and most soil types in New Zealand are more or less deficient in lime) an initial dressing of 10cwt. to 1 ton of lime per acre followed by an annual application of from 3 to 5cwt. per acre or an application every fourth year of 1½ to 2 tons per acre will enhance the returns from phosphate topdressings and prolong pasture growth into the drier seasons of the year.

ROLLING OF PASTURES

Rolling of young pastures to hasten soil consolidation and encourage tillering of seedlings is advisable except on heavy soil types or during frosty weather. A heavy roller is useful on light soils for burying big stones that would otherwise remain on the surface and interfere with haymaking or grass-seeding operations.

SUPPLEMENTARY FEED

Conditions throughout the past autumn have shown the importance of providing for supplies of succulent green fodder to meet the contingencies of protracted dry seasons. Lucerne is adaptable to a fairly wide range of soil and climatic conditions and where strongly established is unsurpassed as a safeguard in such emergencies. Not only will it provide nutritious and succulent feed in the driest autumn, but, in addition, it will afford ample reserves of excellent-quality hay and silage that can be conveniently stored for use during other times of feed scarcity. Statistics of total acreage in lucerne and increased acreages sown during recent years indicate that the value of lucerne is not generally appreciated in New Zealand. As a crop it will succeed under almost any reasonable soil and climatic conditions and is likely to fail only on soils with a high water-table or those containing a hard sub-surface pan. The selection of a suitable site for sowing in lucerne next spring or early summer should be made now and pre-cultivation work commenced.

CROPPING

Cereals: June offers the last opportunity for drilling of late autumn-sown cereal crops. In the South Island winter wheat may still be sown on light to medium land, though it is advisable wherever possible to complete this work by the end of May. In the north, where little winter wheat is sown, any late sowings of oats should be completed early in June. Any early autumn-sown crops may be given a light, quick grazing toward the end of June if weather and soil conditions permit. On areas intended for spring sowings take every opportunity of favourable weather to proceed with cultivation of the soil. Winter fallowing, with exposure of soil to frosts, is especially beneficial on the heavier soil types, and unhurried soil preparation results in better seed-bed conditions at the time of sowing.

If the main cultivation work is done now, there is less likelihood of serious delays in spring sowings even if the planting season should be wet. If the start of cultivation work is postponed until spring, the need for hasty preparations may result in the soil being worked when it is insufficiently dry for cultivation. Such action on clay soils can easily ruin soil structure and necessitate repeated and ill-afforded reworkings to attain satisfactory tilth.

Maize harvesting in the warmer east coast and northern districts is generally completed in June. For maturing the grain, store in well-ventilated, specially-constructed, raised cribs, in racks, or on wire under roofing that gives adequate protection from the weather.

STOCK

The stockman is chiefly engaged in June in providing the winter supplementary feeding rations to livestock, but most sheep farmers will also be called on to attend to crutching of sheep flocks during the month. In-lamb ewes should be crutched at least six weeks before lambing begins and should be handled with care. The feet of any lame sheep should be attended to, and in early lambing districts a watch should be maintained for cast ewes. Hoggets should be running on the sheltered, drier country of sunny aspect. All stock should be kept off wet, low-lying country, especially if it is subject to sudden flooding.

REPAIRS AND MAINTENANCE

Proceed with repair and maintenance work to farm buildings, equipment, machinery, and fencing. High maintenance and repair costs can be avoided by keeping all machines and equipment in store and adequately protected from the weather. Parts subject to corrosion should be cleaned and thoroughly coated with waste oil or grease; a second coating may have to be applied before the winter is over.

WATER SUPPLY

The availability of adequate water supplies, especially for stock in individual fields, during next summer and autumn should be considered now. In the driest autumn stock will thrive on the scantiest of feed only if they have access to plenty of water. In low-rainfall hill-country areas and on the heavier soil types of coastal districts ill served by permanent streams earthwork catchment dams to serve individual paddocks can be scooped out by bulldozers, or large reservoirs of 1,000,000- to 2,000,000-gallon capacity can be built to enable water to be pumped or gravitated to outlying fields.

MINERAL DEFICIENCIES OF FRUIT TREES

By R. VINEY, *Orchard Instructor, Hastings.*

DURING the past few years evidence of mineral deficiencies in fruit trees has become more apparent than ever before. Interest in these deficiencies and their reaction on the trees is increasing among orchardists, and in experiments carried out on orchards throughout New Zealand a definite response has been shown to some of the treatments applied. A description of the effects of some of these deficiencies on trees, foliage, and fruits may help the orchardist to recognise any particular deficiency which may be occurring in his orchard.

IN all branches of agriculture today the subject of mineral deficiencies and their replacement is becoming more important, because of the fact that virgin supplies of organic matter and the mineral elements contained in them are fast disappearing. In New Zealand orchards some of these deficiencies have become more obvious over the past few years, and action must be taken to correct them if healthy trees and the production of good crops of fruit are to be maintained.

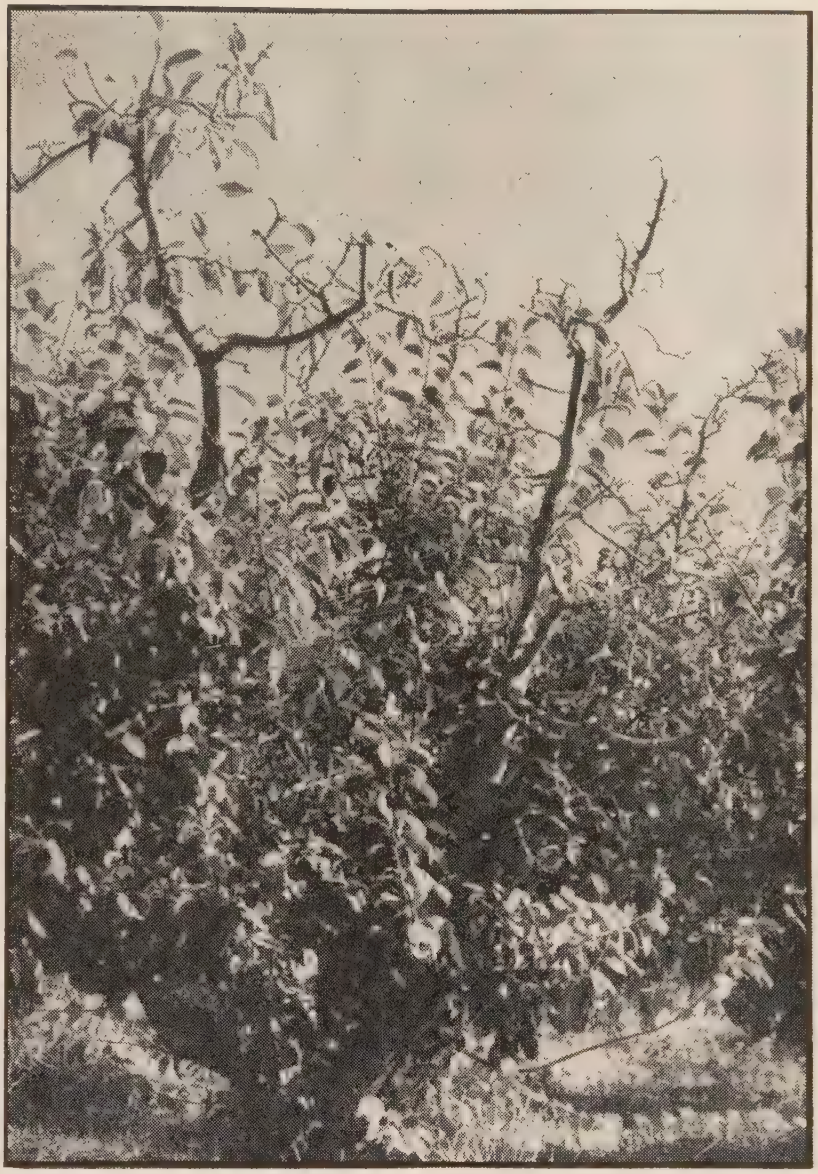
It has been proved beyond doubt that certain mineral elements or nutrients in the soil are essential to healthy plant growth and good crops. If such elements are not available to the plant in a soluble form, visible symptoms on the foliage or fruits will usually be apparent, and in severe cases the plant or tree may die, unless the deficiency is corrected. On the other hand some elements if in excess in the soil are toxic or poisonous to plants.

Mineral elements or nutrients which are required by plants in relatively large amounts are usually referred to as major elements, and those which are required in small amounts are usually called trace elements. Major elements when present in excess appear to be less toxic to plants than trace elements.

A large number of minerals come under the two headings major and trace elements, but those most commonly known are as follows:—

Major elements: Nitrogen, phosphorus, calcium, magnesium, potassium, sulphur.

Trace elements: Manganese, boron, copper, zinc, iron, molybdenum.



[*Geoffrey C. Wood photo*

Symptoms of zinc deficiency on a Gravenstein apple tree, showing "rosetting" of the upper parts and growth on the lower parts.

Some elements, such as sodium, chlorine, and silicon, are beneficial to the growth of certain plants, but so far have not been shown to be absolutely essential to growth. However, in future researches other elements may possibly be found to play a more important role than is realised at present.

Symptoms of Deficiency

The following descriptions of the symptoms shown by fruit trees and their foliage when deficient in some of these elements may assist growers in recognising deficiencies in their orchards.

Nitrogen Deficiency

Nitrogen deficiency and the means of correcting it by the use of nitrogenous fertilisers and leguminous cover crops are fairly well known to most orchardists. Symptoms of nitrogen deficiency in fruit trees are usually as follows:—

Growth is restricted, upright, and spindly; shoots are short and thin; leaves are small, and usually pale yellow-green in the early stages of growth; later they develop highly-coloured tints of yellow, orange, and red, or sometimes purple; tinting begins on the older foliage and proceeds toward the younger leaves; defoliation is premature and begins at the older leaves; lateral shoots are few and lateral buds may die or remain dormant; blossoming in severe cases is greatly reduced and consequently yields of fruit are small. Fruit trees, in addition, show a very marked reddening of the barks, and fruits are small, hard, highly flushed, and possess excellent storage qualities.

When nitrogen is in over-supply for fruit trees the fruit is usually lacking in colour on coloured varieties and has not the same storage life as fruit from trees having less nitrogen available. An over-supply of nitrogen, therefore, can be detrimental.

An orchard which has had no cultivation or manurial treatment of any kind for a few seasons usually furnishes an excellent example of nitrogen deficiency.

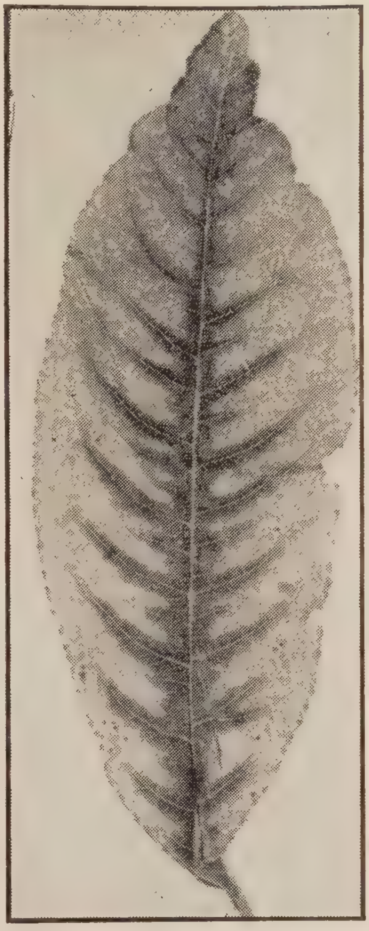
Phosphorus Deficiency

A deficiency of phosphorus has effects on fruit trees which are in many ways similar to those caused by a deficiency of nitrogen, although there are a few distinct differences. With phosphorus deficiency leaf colour is generally a dull, bluish-green and the tints developed are usually purple rather than yellow or red, or they may be a dull bronze with purple or brown spotting. Leaf margins may also show brown scorching effects.

Fruits from phosphorus-deficient trees are unlike those from trees deficient in nitrogen. They have a green ground colour and may be highly flushed; the flesh is soft, the fruit is acid in flavour, and poor in keeping quality. Although the purple tinting of foliage is very common under conditions of phosphorus deficiency, it must be diagnosed with great caution, because it may arise from a variety of other causes which must be ruled out as unlikely before the symptom can be traced confidently to phosphorus deficiency.

Potassium Deficiency

Potassium deficiency is of outstanding importance in relation to the quality and condition of the fruit, while trees are stunted, and die-back of shoots and branches is common. The leaves are bluish-green and may show some yellowing (intervenal chlorosis), and all leaves show typical brown or grey marginal scorching. Blossom buds may be plentiful in the early stages of the deficiency. Fruit yields are very low, and quality and colour are poor. On apple leaves marginal scorching is the outstanding symptom, while there may be some intervenal chlorosis. Apple fruits may be very highly flushed, or remain green and of immature appearance, and have a sub-acid and woody taste. In pear trees the scorched margins of the leaves are almost black. In plum, peach, and cherry trees there may be considerable chlorosis in addition to scorch, and some varieties show considerable upward rolling of the leaf margins.



Symptoms of manganese deficiency on peach foliage.

Calcium Deficiency

The main symptoms of calcium deficiency appear in the young leaves near the growing tips and in the root system. The young leaves may be severely distorted, and may either be rolled upward along the margins or curled downward toward the undersurfaces. The leaf edges are irregular, often appearing ragged, and may show brown scorching on thin, chlorotic, marginal bands. Root systems are invariably poorly developed, remaining stumpy and failing to elongate. The death of growing points of terminal shoots, followed by die-back of affected shoots, may result from this deficiency.

In the field calcium deficiency symptoms may be complicated by secondary effects of acidity, but it has been shown in sand cultures that the effects may be caused by a deficiency of phosphorus.

Magnesium Deficiency

Symptoms of magnesium deficiency are always most marked on the foliage, and the effects always develop initially on the oldest leaves, and proceed systematically toward the younger ones. Chlorotic effects are common, which is not surprising, as magnesium is a constituent of chlorophyll, the green colouring matter of the leaf. But chlorosis is by no means the only colour effect produced, and brilliant tints are often developed. The deficiency is most prevalent toward the end of growth seasons, but it may appear in rainy periods. The usual sequence is that the oldest leaves are the first to develop the symptoms, which intensify either gradually or quickly, while simultaneously they spread progressively toward the younger leaves.

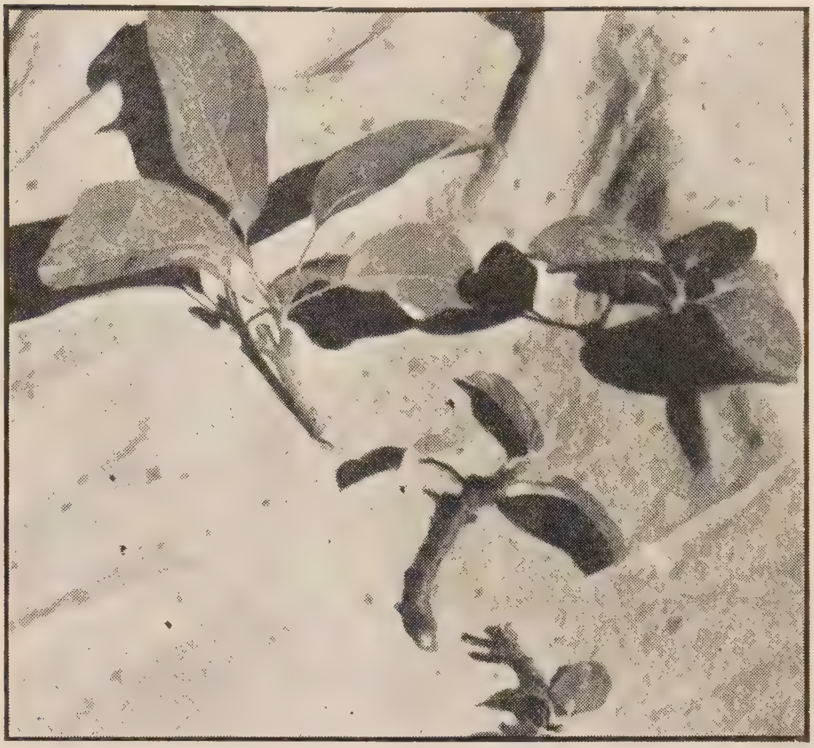
Defoliation may be severe before the harvest and a heavy-cropping tree may be left bearing no leaves, other than those on the tips of shoots, and consequently it is unable to mature or ripen the crop. Severe effects of this deficiency have occurred on apple trees in the Nelson district, and in their simplest form the symptoms consist merely of an intervenal necrosis, either in areas around the mid-ribs of leaves, or beginning near the margins and developing progressively toward the mid-rib. The brown necrotic (dead) condition is preceded by a slight fading of the normal green colour in the areas to be affected later, and these light-green areas also feel limp and thin to the touch. The necrosis may be preceded by a purple tinting which fades as the necrosis develops, or the necrosis may be accompanied by an intervenal chlorosis. In some examples of marginal necrosis it is difficult to distinguish the symptoms from those which result from potassium deficiency.

Sulphur Deficiency

The effects of sulphur deficiencies in many ways resemble those caused by nitrogen deficiency. Shoot growth becomes restricted, though less so than with nitrogen deficiency; growth is erect and yellow tinting of the leaves occurs. Brilliant orange and red tints also develop on the foliage.

Iron Deficiency

Iron deficiency is fairly common in fruit trees. The main symptom is always severe chlorosis of the leaves, and young growths are always most severely affected. In some instances the leaves may be almost wholly bleached to a creamy-white colour and in others the chlorosis may produce a mottled pattern. Scorching of leaf margins and tips may occur in extreme conditions. Chlorosis from iron deficiency has almost invariably been associated with soils having a high lime content.



[*Geoffrey O. Wood photo.*

Apple tree foliage showing "little leaf," a symptom of zinc deficiency, compared with normal foliage.

Manganese Deficiency

Chlorosis of the leaves is one of the most common symptoms of manganese deficiency. With apple trees the leaves develop an intervenal chlorosis which begins near the margins and extends toward the mid-ribs, until finally only the veins remain green. Strongly-growing young shoots may be only slightly affected, which is a point of difference from iron deficiency, in which the chlorotic condition is always most severe in the young tip foliage. With pear trees the normal green of the leaves may appear slightly faded, and a somewhat faint intervenal chlorosis develops, beginning near the margins and progressing toward the mid-rib. The chlorosis is very distinct from that caused by iron deficiency. Peach, plum, and cherry trees show similar symptoms with peach foliage especially liable to become severely chlorotic. Peach trees in parts of Hawke's Bay last season showed a very pronounced chlorotic condition, and the symptoms were typical of manganese deficiency.

Boron Deficiency

Fruits from trees having a boron deficiency are malformed and misshapen. The exteriors may show cracking, pitting, and roughening of the skin, and, internally, corky areas in the cortex and browning in the core region may occur. The so-called disease "corky pit" on apple fruits is the result of boron deficiency, and is well known in parts of New Zealand. The trees may lose some of their leaves and develop a condition of the foliage known as rosetting; defoliation and rosette symptoms are accompanied by splitting and roughening of the bark, and by die-back of the twigs and branches.

Zinc Deficiency

Recent experiments have more or less proved that zinc deficiency is occurring on orchards in parts of New Zealand. In U.S.A. and other countries this deficiency is considered to be the cause of "little leaf" or "rosette" of apples, vines, and stone fruits. The rosettes of small stiff leaves issuing almost directly from the branches in the first flush of spring growth are the most reliable indication of this deficiency. These leaves may or may not be mottled in appearance and they never become more than 1in. long or about 0.25in. wide. From below these affected leaves shoots tend to grow that may bear healthy green leaves throughout the summer. Although some trees begin to die back when they have been affected for a year or two, others take many years to do so. There is always a reduction in the number of fruit buds on trees rather badly affected; usually, however, nearly all the flowers fail to set on badly-affected parts of a tree. Often the upper parts of trees are badly affected and bear only a few abnormally-shaped fruits, while the lower parts are normal in foliage, and bear at least a medium crop of normal fruit.

Experiments and Control

Experiments have been carried out for many years, even as far back as the last century, to find out the part played by some of these minerals. The method used was to grow plants in sand and water cultures under controlled conditions and to feed the plants artificially with solutions of pure chemicals. Deficiencies of the individual nutrient elements were created in the nutrient medium by omitting them separately from the complete nutrient solution. The symptoms produced in this way were recorded, and were subsequently checked by comparison with field trials of deficiencies proved to be from the same causes.

More recent experiments have shown that spraying the trees with a solution of the mineral element thought to be deficient may produce results in a very short time, usually within 14 days of the application. The main factors requiring attention are the correct strength of spray to use for it to be effective but not to damage the foliage, and the appropriate time to spray.

Concentrations of 0.1 and 1.0 per cent. suitable for spray applications of cent. are suitable for spray applications of trace elements, and between 1.0 and 4.0 per cent. for compounds of major elements; to these solutions it is necessary to add a spreading agent and hydrated lime.

Soil dressings with some mineral elements and injection of others into stems and branches of fruit trees have also shown excellent results, but it is important in all cases to use suitable dosages, as under-dosages may not be effective and over-dosages may result in serious injury to the trees.

Boron deficiency in plants and trees is now fairly well known in parts of New Zealand. With apple trees the control of this deficiency by the use of borax either as a soil dressing or in a spray solution is a standard practice for the control of "corky pit" which develops in apple fruits as a result of boron deficiency.

Use of Dolomite

In the Nelson district increasing use is being made of a local limestone called dolomite, which contains magnesium, for controlling magnesium deficiency of fruit trees. The limestone is applied as a soil dressing, and although practically no results are apparent for about two years after application, results have shown that the limestone will gradually correct magnesium deficiencies.

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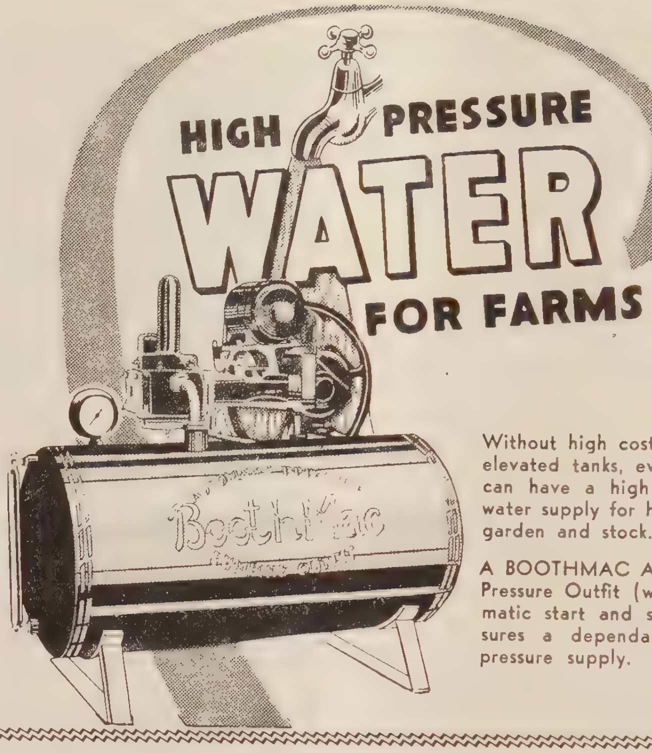

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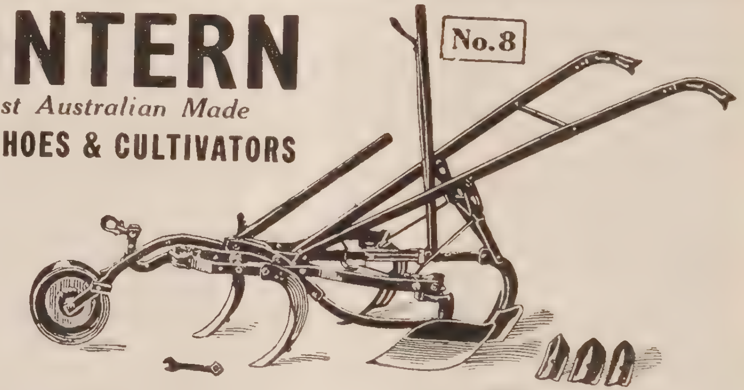

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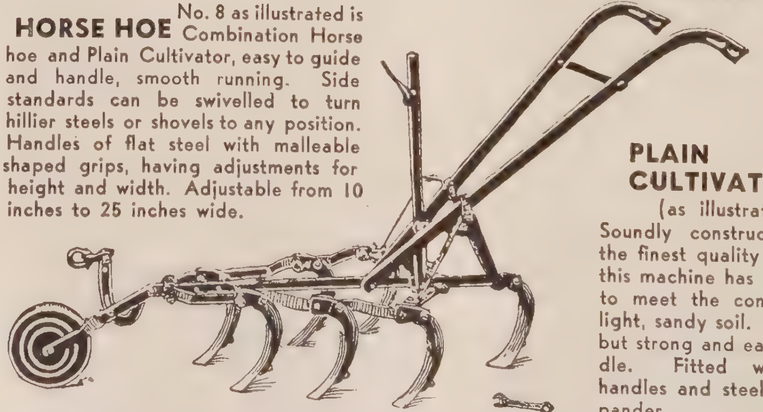

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MINERAL DEFICIENCIES OF FRUIT TREES

An article on zinc deficiency of apple trees, edited by J. D. Atkinson, Plant Diseases Division, Department of Scientific and Industrial Research, Auckland, and written by an Auckland fruit grower, appeared in the April, 1947, issue of "The Orchardist," in which it was stated that apples showed a definite response to spraying with a solution containing zinc sulphate.

An unofficial trial was carried out last year by an orchardist on the Moutere Hills at Tasman. Gravenstein apple trees in this orchard showed all the symptoms of zinc deficiency, and it was decided to spray a block of the trees with a solution containing zinc sulphate. Another block of trees was left unsprayed as a check plot. The results of the trial showed that a definite response was made by the trees which were treated and there appeared to be little doubt that these trees were suffering from a deficiency of zinc.

In the Hawke's Bay district experiments are being carried out by spraying stone fruit trees with manganese sulphate to correct a suspected manganese deficiency, and in this trial also there has been a definite response to the treatment applied.

Experiments in Infancy

It must be emphasised, however, that some of these experiments are still in their infancy, and it may be a few years yet before any definite recommendations can be made for correcting these deficiencies. The subject is of vital importance to all branches of agriculture, and some idea of the magnitude of the task facing experimentalists and scientists can be gathered from the fact that so many points have to be considered and tested before definite recommendations can be made.

Some points in the absorption of mineral nutrients by plants and trees are as follows:—

1. Mineral nutrients must be absorbed from relatively dilute solutions, or the plants may be injured or even killed.
2. Certain of the elements slow down the absorption into the plants of other elements; for example, calcium slows down potassium, and vice versa.
3. Healthy plants or trees result when the nutrients are absorbed in certain relative proportions. When the proportions are suitable the nutrient medium is said to be balanced. When ratios between nutrients are too wide deficiency conditions are created. Thus, if a high proportion of nitrogen to potassium is absorbed, the plant or tree may suffer from potassium deficiency.
4. Nutrients, though present in the nutrient solution in satisfactory amounts and proportions, may not be absorbed by the plant or tree unless the acidity and alkalinity "reaction" of the solution is satisfactory.

[*Geoffrey C. Wood photo.*

Strong growth on the lower parts of a tree while the top declines is an early symptom of zinc deficiency.

Similar Symptoms

Many other factors such as weather and soil have to be taken into consideration when dealing with suspected mineral deficiencies, as these may produce results on foliage and trees which are similar to symptoms of mineral deficiencies. For instance, drought, low temperatures, or frosts may produce symptoms similar to deficiencies of nitrogen and phosphorus. Waterlogging of the soil may produce various tints on the foliage; for example, marginal scorch similar to potassium deficiency, and partial chlorosis similar to deficiencies of manganese or iron.

Virus diseases, fungoid and bacterial diseases, insect pests, etc., have also to be considered, as these may also produce symptoms similar to those resulting from mineral deficiencies.

One by one, new elements have been added to the list of those known to be necessary for plant growth and health, and as further experiments are carried out it will no doubt be proved that some of those thought to be trace elements should really be termed major elements. It is evident that in the future more attention must be paid to soil deficiencies of all elements essential for the healthy development of trees and plants, as crops grown on highly-cultivated soils are exhausting the reserves of these elements.

References: "The Diagnosis of Mineral Deficiencies in Plants by Visual Symptoms," T. Wallace, M.C., D.Sc., A.I.C.; "Soils and Men" (U.S.A. Year Book of Agriculture, 1938), U.S.A. Department of Agriculture; "Zinc as a Nutrient for Plants" (extract from "The Botanical Gazette," June, 1937), W. H. Chandler.

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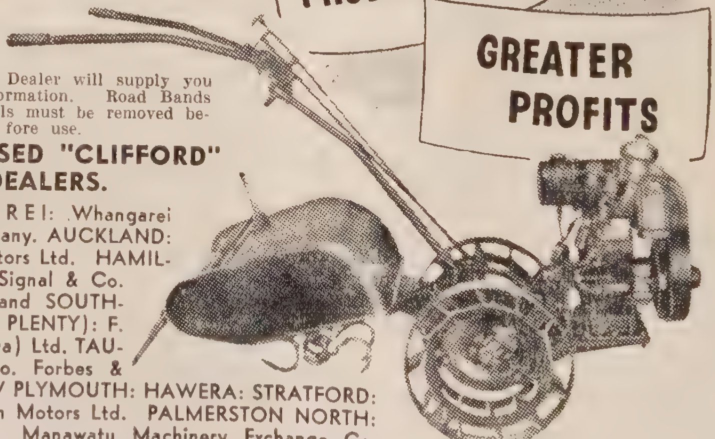

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Agricultural Education and Research in Japan

NEW ZEALAND soldiers in Japan often speak most derisively of the country's farming methods, writes A. V. Allo, formerly Instructor in Agriculture, Tauranga, who recently returned from service with the occupation forces in Japan. In their opinion Japan is a land of backward peasant farmers completely unaffected by the progress agriculture has made during the past century in the western world. They cannot reconcile agricultural research with small farms, primitive implements, the ubiquitous "honey cart" with its burden of nightsoil, and the many farm scenes strange to western eyes. But Japan is by no means a country of ignorant farmers with no knowledge whatever of agricultural science. Research is very real and of vital importance to the economic welfare of the community.

ANY country that has to feed nearly 80,000,000 people on about 15,000,000 acres of farming land can have no illusions about the necessity of knowing as much as possible of its agricultural conditions, and to exist it must explore every means of increasing production. The style of farming practised in Japan is vastly different from New Zealand methods, but Japanese agricultural research workers have just as sound a knowledge of their own methods of farming as have their New Zealand counterparts. They have made many notable additions to the store of knowledge of Oriental agriculture and number several world-famous figures in their ranks. Men like Tanaka, Kikuchi, Namikawa, and Matsumoto are well known to all horticulturists for their work on citrus and persimmon culture, and Harafusa Nakano was a botanist of world renown.

New Strains of Crops

In a period of only about 50 years exhaustive studies have been made in certain lines of research. One of the first was an attempt to raise new strains of cereals, root crops, and vegetables so that specific varieties could be bred to suit specific soils and climates. A variety of wheat which produces a good crop in the subtropical southern areas cannot be expected to give similar results in the colder north. Geneticists have bred new lines of all main agricultural crops, each adapted to a certain district. For instance, there are now more than 30 strains of Norin wheat, each advocated for a specific area. ("Norin" means "agriculture.") There are also many Norin strains of barley, naked barley, potatoes, sweet potatoes, and soy beans. The Japanese agriculturist is now able to nominate the most suitable variety of grain, root, or pulse crop for any part of Japan.

Exhaustive studies have been made in the realms of horticulture, sericulture, and plant pathology, and a complete soil survey has been made of the whole country. The work done in Japan on the control of soil erosion is known throughout the world, and the country is generally considered to have one of the most efficient systems of erosion control. Though that system has broken down to some extent as an aftermath of the war, the knowledge still exists and could be made profitable use of by many western countries faced with the problem of an ever-increasing soil loss.

Japan has about 377 State agricultural research stations and 35 privately-owned experimental farms and laboratories. New Zealanders who were at Lincoln College in the early 1930's may remember a Japanese student, Isamu Kawase. He is now running his own grassland research station at Gifu, near Kyoto, after having been bombed out of his original farm at Kobe.

In Japan the tendency is to establish a station to study a particular crop or a restricted set of problems instead of providing facilities for the study of all or most of the problems peculiar to the area. Most of these stations deal with the production and processing of grain crops, fruit, vegetables, tea, or silk. The raising of new and improved varieties of important crops, cultural experiments with fertilisers and manures, and control of insect pests and diseases are among the chief subjects dealt with. Livestock research is concentrated at a few stations, as the stock population is relatively small.

Research Farms

In addition to the State and privately-owned research stations, there are also research farms owned and operated by the agriculture faculties of the imperial universities. Tokyo Imperial University has two such farms, both directed by Professor Takashi Sasaki, Professor of Crop Science, and each managed by a highly-qualified research worker who also has a sound practical background. The purpose of these farms is twofold: To provide practical instruction for students taking agricultural degree courses, and for research.

One of these farms is at Tama, 13 miles west of Tokyo. It consists of 72.8 acres of typical kanto loam soil, alluvial in origin, and has been operating since 1939. The farm is very well laid out, with several splendid plantations of native trees, and has ample buildings for all requirements. All permanent roadways are grassed, and shelter belts surround each field. Many hedges consist of tea bushes, combining shelter with a useful crop. The farm operations are concerned mostly with agriculture rather than livestock. Large areas are in wheat, rice, barley, naked barley, and potatoes —the staple crops of Japan—and varietal or cultural trials are conducted on those crops every year. Much research is also done on vegetable culture, and 4½ acres of mixed orchard increases the diversity of farm production.

Finally, there is one feature possible only in a country of peasant farmers, a 3-acre holding which is completely self-supporting and self-contained and on which is conducted research into farm management problems. It is worked by a farmer and his family according to the latest scientific methods, and full records of all operations are kept so that students may learn of the practical effects of applying the results of research to individual farms.

The farm has five Friesian cows, two draught cows, and two draught horses, all in very poor condition because of the shortage of suitable fodder. Last year successful experiments were carried out in the making of silage from the tops of sweet potatoes, the result being of quite good quality. That offers fresh hopes of an improvement in Japan's supplies of stock fodder.

The other farm, at Ninemiya, about 35 miles south-east of Tokyo, is on a sandy loam soil about two miles from the sea and is used almost wholly for horticultural research. The farm, beautifully laid out, contains 8 acres of flat country and 3½ acres of hillside. The main buildings are approached by a long drive flanked by well-kept lawns and shrubs, and the whole place has an air of well-being not commonly seen in Japan today. On the flats are grown pears, persimmons, figs, grapes, peaches, yams, and chestnuts, all of which have been interplanted with wheat or barley to increase food production. A small area of strawberries was planted in rows 2ft. apart, the rows being inter-planted with wheat. When the wheat is harvested soy beans are planted, with good results. Much of the hillside is in native trees and shrubs, with the easier slopes in loquats and Japanese mume, or sour plum, used for jams and pickles. At the crest of the hill is a small citrus orchard, consisting mainly of unshiu or mandarins. Several glasshouses are used for various lines of research, and a small

RESEARCH IN JAPAN . . .

but efficient cannery plant gives the students valuable training in the arts of fruit processing.

A total of 130 students attends these farms every week. They live in hostels and their time is divided between practical work and lectures given by a highly-qualified staff of nine at Tama and four at Ninemiya. After one group has spent a month or so on the farm a fresh group of students comes from the university and the students from the farm return to lectures in Tokyo. The agricultural degree course is of three years, during which time students must do original research in some branch of the subject. Such research is done in well-equipped laboratories at the university and on one or both of these two farms. For a doctor's degree a thesis on a more advanced subject is prepared, and no written papers must be sat to obtain this degree, the presentation of a satisfactory thesis being deemed sufficient evidence of ability and work.

In the many agricultural high schools throughout the country the courses are from four to five years, and a student completing such a course has a sound theoretical and practical background, equivalent to that possessed by a student passing out of Feilding Agricultural High School.

Results Applied Very Slowly

Agricultural education is quite an active force in Japan, with highly-trained and qualified research workers devoted to all branches of the subject. The principal problem, according to most research workers with whom the subject was discussed, is to persuade the peasant farmers to adopt new methods and practices. The Japanese farmer is ultra-conservative. "What was good enough for my father is good enough for me" is his guiding motive. In addition, he is not very literate and can read only the most simple of books, if he can read at all. Persuading him to use the new Norin strains of crop plants has taken a long time, though he now appreciates their value. Patience, tact, and persistence are needed in dealing with him, and the process of applying the results of academic research to the individual farm is very slow.

However, much headway has been made during the past few years, and the considerable increases in crop yields during the past 20 years indicate that the Japanese farmer, though possibly slow to learn and to adapt himself to new ideas, has at least started to emerge from his shell of tradition, encrusted with superstition and ignorance. As the older generation is being replaced with a more highly-educated younger generation this advance is likely to be accelerated.

TREATMENT OF YOUNG PASTURES

By E. M. BATES,

Instructor in Agriculture, Hawera.

IF a good strike of grass and clover has been obtained, successful establishment of new autumn-sown permanent pasture will depend mainly on good grazing management. Firmness of the ground is essential to good root hold, pasture vigour, and the carrying of heavier stock.

LIGHT stock, preferably sheep, are best for the first grazing, but young cattle may be the only stock available in some dairying districts. Heavy stocking over short periods, without pastures being grazed too closely, gives good hoof consolidation and more even grazing and distribution of stock nitrogen.

Overgrazing and Undergrazing

Persistent close grazing reduces root development and vitality of plants, causing a lower over-all production of grass during winter and early spring. Undergrazing of young pastures is perhaps a more common fault and equally undesirable; tillering is discouraged and strongly-growing temporary species such as Italian ryegrass or short-rotation ryegrass shade and repress the slower, more permanent species in a mixed pasture sowing.

Rough growth between grazings, though not usual under sheep grazing, is more likely to occur on dairy farms. In favourable conditions a March sowing will need at least three grazings before September. The young pasture should not be made to act as supplementary feed at the expense of successful establishment of any of the pasture species. Judicious intermittent grazing normally produces a sward satisfactory to the conditions, but topdressing with superphosphate in spring will further assist young plants, especially the clovers.

Ryegrass Establishment

Ryegrass establishes rapidly in a wide range of conditions and normally is through the ground in about a week. Other grasses, such as cocksfoot and dogstail, are slower appearing. Under adverse conditions ryegrass has the best chance of establishment, though if checked it is reduced in vigour during early development.

Late sowings containing cocksfoot, dogstail, and clovers may fail in cold conditions. Clovers which are essential to pasture welfare frequently do not establish well when sowing has been delayed. Pastures which have been sown early make good growth during the early winter, but when sown late are slow coming away and produce less winter feed; in general they require more careful handling.

Weed Control

Weeds give least trouble in autumn-sown pastures. Pasture sowings usually contain a good proportion of ryegrass, which will smother most annual and perennial weeds attempting to establish at the same time. Most aggressive perennial weeds are more or less dormant in the late autumn and winter. The aim in control of perennial weeds such as fern and blackberry is to establish a good cover during the winter and have sufficient growth to maintain heavy stocking when the weeds are most vulnerable. Ragwort is eaten by sheep but not by cattle.

Summer annuals are of little account in new autumn-sown pastures but may establish in spring if the ground has been badly poached during the winter by being grazed when soft.

Weeds such as docks and oxeye daisy, which are slow to establish from seed, have a better chance of establishment in autumn-sown pastures. Competition is then less keen than it would be with a spring sowing.

[*"New Zealand Farmer" photo.*

Heavy stocking over short periods helps in the successful establishment of young pastures.

A Light Cramp for Assembling Hive Supers

By C. R. PATERSON, *Apiary Instructor, Hamilton.*

MOST cramps used for assembling hive supers are heavily constructed and occupy considerable space in the workroom when not in use. This article describes how half-checked hive supers can be assembled with a lightly-constructed cramp used by Messrs. Higgins Bros., Waihi, who find it efficient for nailing up large numbers of supers.

THOUGH dovetailed supers require considerable pressure to cramp them into position, half-checked supers need only a light cramp such as the one illustrated to hold the four pieces firmly together for nailing.

Before assembling hive supers the ends should be given a coat of priming paint. It is advisable before stirring the paint to pour some of the oil into another tin, as this ensures a fairly thick mixture of the right consistency for a nailed-up joint.

The cramp is set up on two solid stands or boxes and the sides placed in position. Fig. 1 shows the ends placed in position after being painted at the corners. The cramp handle is then turned to press the sides hard into the check corners of the end pieces.

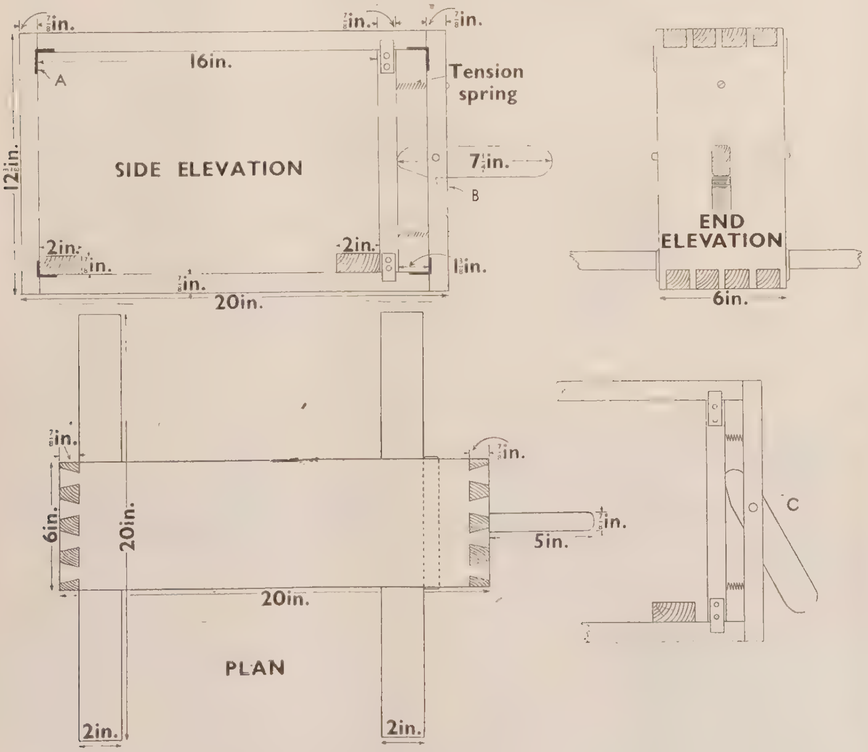
The cramp is then turned over, bringing the end piece on top (Fig. 2). In this position nails are driven in, drawing the ends of the super tightly to the sides. The other end is nailed by turning the cramp into a horizontal position.

Fig. 3 shows how the super is cramped for the final nailing of the sides.

As it may be difficult to obtain a suitable handle and screw, a more simple construction is shown in the diagrams below.

When not in use the cramp can be hung on a peg in the workshop.

Supers should be given a coat of paint as soon as possible after nailing up, as the sides crack very quickly after removal from a bundle and exposure to drying air. As hive material is now both expensive and hard to obtain, careful attention to the assembling of it and to its preservation against premature decay is essential.



A—Narrow piece of angle iron to strengthen corners. B—Piece cut away to allow handle to go down. C—The position of the handle when released. The two springs pull back the sliding piece.

METHOD OF USING CRAMP

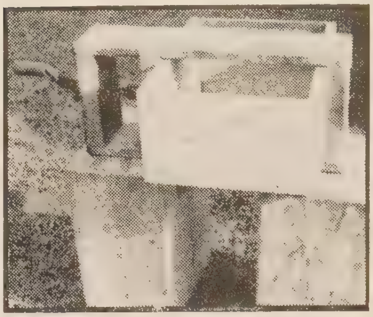


Fig. 1—The ends of the super placed in position after being painted at the corners.

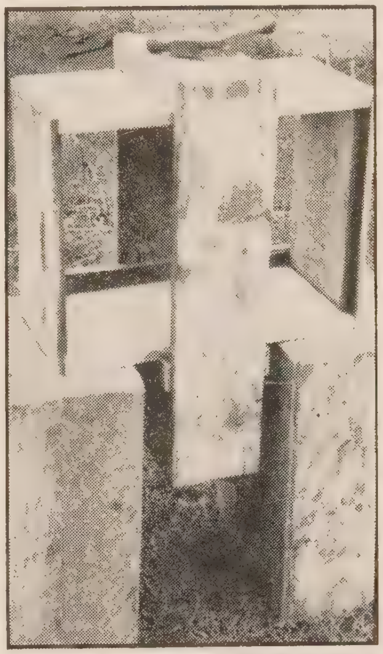


Fig. 2—The cramp turned over, bringing the end piece to the top for nailing the ends of the super.

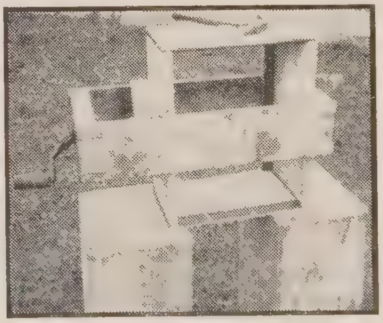


Fig. 3—Cramping of the super for final nailing of the sides.

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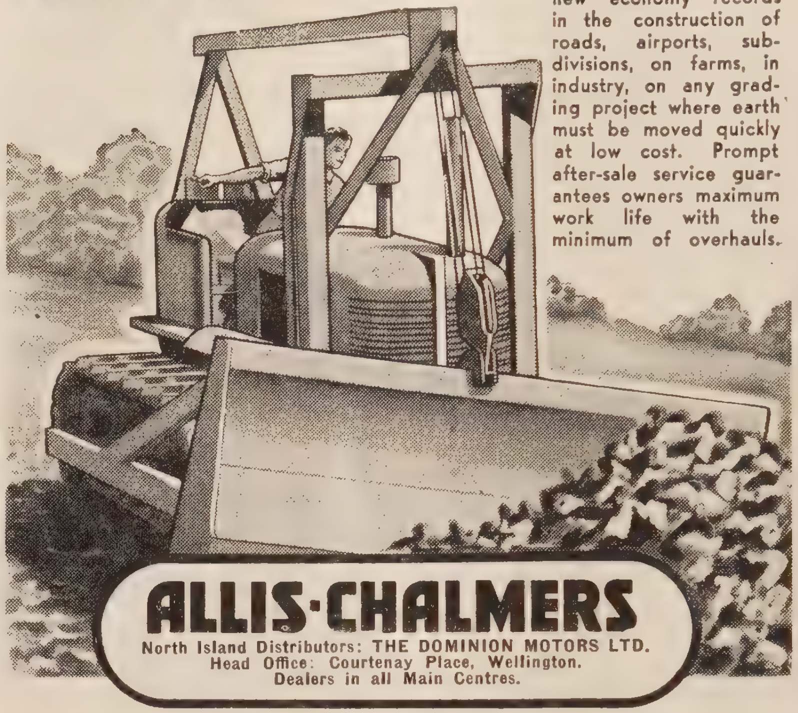

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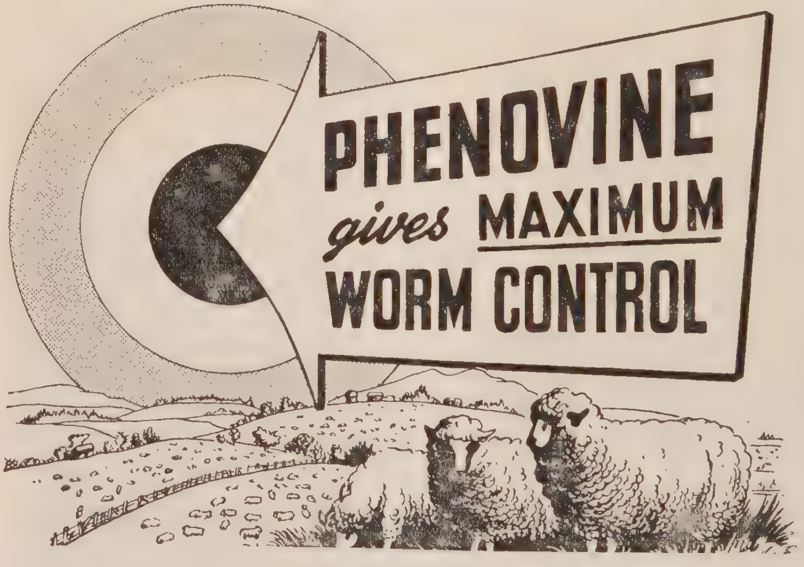

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Winter Spelling and Winter Grazing on the Dairy Farm

By E. M. BATES, *Instructor in Agriculture, Hawera.*

EXPLOITATION of the winter-growing characteristic of ryegrass as a means of saving grass for rationing to the dairy cows in the early spring and a programme of wintering the herd need to be considered by dairy farmers in preparation for the next milking season.

HIGH production on a dairy farm is usually associated with pastures containing a large proportion of ryegrass. When the majority of grasses are practically dormant, ryegrass species are capable of making reasonable winter and early spring growth. Short-rotation ryegrass (formerly called H1 ryegrass) is capable of stronger growth during this period than is perennial ryegrass, but except on highly-fertile, well-consolidated soils it tends to thin out after the first year or two. In dairying districts short-rotation ryegrass should be included in grass sowings, but the proportions of the two ryegrasses must depend on soil conditions.

Saving Grass for Rationing

In the more favoured dairying districts the winter-growing characteristic of the ryegrasses should be exploited widely to produce grass for rationing to the cows as they come into profit. Ryegrass is weakened by close and continuous winter grazing, which often results in clover dominance. This clover, eventually coming away in spring, is likely to constitute a dangerous flush growth, causing feed flavours in the cream and bloat among the best producing cows. On the other hand, under winter spelling pastures tend to become grassy. Reasonably-close grazing followed by harrowing before paddocks are closed for saved grass will avoid unduly rank growth at any stage in the selected areas and keep the pastures growing.

Yorkshire fog, also a winter grower, is weakened under intermittent grazing and high stock concentration during grazing. Adequate harrowing to spread droppings after grazing further invigorates ryegrass at the expense of the fog. A good cleaning up with stock and avoiding too early closing are wise. However, where fog is troublesome the paddock should not be used for saved grass if that can be avoided.

The number of paddocks which may be reserved for rationing to the cows as they calve depends on pasture conditions, winter feed reserve, subdivision, layout of farm, winter grazing technique, and number of stock being wintered. The dairy farmer may aim to save grass on one-third of his farm by closing paddocks in rotation from about mid-April until the cows dry off about the end of May. Saved grass for the milking cows is then available from the end of July to the end of August or later as required.

Winter Grazing

Systematic grazing on the paddocks for wintering should be carried out during June and July when the cows are dry. If 10 paddocks are available for wintering, a round would take about 30 days on a basis of three days and nights of grazing each paddock in turn. Supplementary feeding should be given in the paddock where the stock is grazing at the time. Allowance for earlier supplementary feeding should be possible in most districts if the season has been a good one for the production of silage, hay, and roots.

Timely culling will lessen the risks of overstocking during winter. One or two of the earlier grazed paddocks should be omitted in the second round and kept for the cows immediately after the rationed grass is finished.

Method of Rationing

When sufficient cows have calved (say 10 to 15) they should be given an hour or two a day on saved grass fed in a paddock near the shed. Feeding out after night milking is not difficult if the load is made ready during the day. As soon as the grass in the first of the saved paddocks is insufficient to give a bellyful to the milkers, they should go to the next saved paddock for rationing. They should be returned to the previous saved paddock for the rest of the day and also at night for supplementary feeding, varied according to the grass the cows are getting. By confining milking cows to two paddocks, one for short spells of grass feeding and the other for feeding out day and night, grass will go further and provision of closed paddocks is easier.

On many farms electric fences have come into favour for subdivision of grass paddocks for feeding off in breaks. A single wire with a few iron standards is sufficient and is easily moved diagonally for the next break. The cows will graze the fresh feed, leaving the adjoining grazed breaks. The electric fence is also used to advantage for cutting up larger paddocks temporarily, about 10 cows an acre being the usual grazing concentration.

Spring Growth

As spring growth comes away the full range of paddocks in turn should be available to milkers. A basis of two days and nights is often used. Dry stock follow the herd for a similar period, after which the paddock is chain harrowed and reclosed.

With the spring growth, paddocks are missed out of the grazing rotation for early cuts of silage and hay. Too early closing up may pinch the cows, but too late closing results in inefficient utilisation of grass and damage to pastures. The basis of good, even pastures and good pasture utilisation lies in the saving of every acre of surplus spring grass as silage and early-cut hay. That also enables efficient grazing of the remainder of the farm.

Night and Day Paddocks

On many dairy farms the back paddocks frequently hold very inferior swards because of their being used as day paddocks. Early-summer ploughing, fallowing, and early-autumn sowing to new pasture are required on many such paddocks. The night paddocks handy to the shed usually have the most vigorous ryegrass.

The cow grazes on an average twice during the day and once at night, usually before midnight. The herd therefore goes out hungry in the morning to the faraway paddocks and most of the dung is deposited in the night paddocks. This practice, though convenient, produces great variation in the pasture composition of paddocks. If grazing is restricted to paddocks for day and night grazing, the farm swards tend to become more uniform and less upset is caused by changes in the diet from one paddock to another. However, the layouts of many dairy farms present practical difficulties which largely determine the system of grazing adopted and the quantity of grass saved for rationing.

Checking Soil Erosion in Citrus Orchards

By P. EVERETT, *Orchard Instructor, Kaikohe.*

MUCH of the surface soil of many cultivated citrus orchards is lost annually by erosion. Usually the damage is of the sheet erosion type—a general loss of surface soil from all cultivated slopes, the soil being carried away in the form of muddy water. Rapid erosion causes obvious gullies in the cultivated soil, but loss by sheet erosion is usually unnoticed unless the orchardist specifically seeks evidence of it, such as accumulation of silt in hollows or on flat land at the lower edge of the orchard area. This accumulation will represent only a small portion of the soil washed off the slope, most of it having been carried away in the streams.

CONTINUED loss of soil depletes the trees' food supply and has the ultimate effect of reducing their vigour and shortening their profitable life. The amount of fertiliser normally applied must be greatly increased to counteract the effects of the soil erosion, as plant nutrients are also carried away with the soil, and that is but a temporary expedient where the erosion continues annually. Consequently, to promote and maintain tree vigour every possible means should be adopted to reduce soil erosion to a minimum.

Soil Structure

The vulnerability of soils to erosive forces of wind and water is governed in no small measure by the soil structure and the organic matter they contain. The structure of a soil is the way in which individual particles of clay, sand, and silt are aggregated, and the organic matter is the principal medium by which soil particles are held together in aggregates. When these aggregates or "crumbs" are well developed water penetration is rapid and the soil is easy to cultivate. Any type of soil cultivation tends to injure the crumb structure, and with intensive cultivation for a number of years this deterioration becomes very great, especially if the implements used are those which produce excessive agitation of the soil, such as rotary cultivators. The deterioration of soil structure under such conditions is especially rapid where no special efforts are made to replenish the organic matter in the soil.

Until comparatively-recent years it was considered desirable to maintain a fine tilth in the surface soil of citrus orchards, on the assumption that the soil mulch so formed prevented the capillary rise of water to the surface and its loss by evaporation. However, modern research has shown that such capillary rise does not take place unless deep cracks occur in the surface soil, and it is now considered that cultivation conserves moisture almost exclusively by the control of weeds, a heavy crop of which causes appreciable loss of moisture through transpiration.

Clean-cultivated soil with its structure destroyed by excessive agitation readily becomes very compact and absorbs water slowly. Penetration of water into the subsoil is further delayed by the plough sole, which is made more difficult to penetrate with each cultivation. Falling raindrops have considerable energy, which is expended in pounding the surface of the soil, in many soil types forming a thin crust which effectively seals the surface against the rapid intake of water. As this crust is produced on a fine mulch in the first few minutes of a heavy rain, a high proportion of the rain water must run off, carrying with it soil particles, even though the flow may not be fast enough or in sufficient depth to cause obvious washing.

Methods of Control

Measures that should be adopted to reduce soil erosion to a minimum vary greatly in different orchards and are influenced principally by degree of slope, soil texture, length of slope, and intensity of rainfall, However, for all orchards with up to moderate slopes the following measures are suggested:

1. Maintain soil organic matter at a high level. To achieve that the maximum amount of annual cover crop should be grown during the autumn and winter. Volunteer weed growth is usually inadequate for the purpose, so suitable green crops such as blue lupin should be sown each year. It is important that cover crops be incorporated with the soil by such methods as discing or rotary hoeing rather than by turning them under with a mouldboard plough, so that some of the vegetation is left on and near the soil surface to check erosion.

2. During the season when inadequate soil moisture is likely to occur cultivate only sufficiently to obtain reasonable weed control. Ridges left by cultivation should be across the slope so that they dam the water on to the area, increasing the time for absorption. Leave the surface somewhat cloddy, as a rough surface will absorb water more rapidly than a fine mulch on which a crust may develop, and the lumps of soil reduce the quantity of soil particles carried away in the excess rain water.

3. Break long slopes into shorter sections by constructing low banks or surface drains at intervals down the slope on carefully-surveyed lines providing for a very gentle fall, so that excess water is led to drainage ways without causing erosion. Where possible, such drainage ways should be on headlands. Where the excess water must be led down the slope through a portion of the orchard, grassing down the lower part of the drainage channels is usually necessary to prevent gullying.

Where the slope is too steep for the methods suggested to be adequate, and on lesser slopes where the soil type is extremely erodable, it may be advantageous to sow down alternate alleyways in a semi-permanent pasture, such as red clover, or the whole area may be sown down except for circles under the spread of the trees. Such pasture should be recultivated every second or third year. The pasture should be mown at frequent intervals when soil moisture is likely to be inadequate to minimise loss by transpiration. Alternate mowings should be used as a mulch under the trees unless adequate mulching material is available from outside the orchard area.

Other Factors Affecting Erosion

Many factors other than soil structure and organic matter affect the amount of erosion in orchard areas, the most important being:—

Intensity of rainfall: In the principal citrus-growing areas of New Zealand heavy rains are not uncommon during spring and summer, when the orchards are clean cultivated. Under such conditions soil is readily washed downhill, especially during rapid precipitation.

Degree of Slope: Other factors being similar, the steeper the slope the greater will be the erosion. Evidence from overseas suggests that the loss of soil under clean cultivation on a 10 per cent. slope (1 in 10) is not less than 20 tons an acre annually and may be much higher.

Length of slope: Under clean cultivation the amount of erosion will increase with the length of the slope.

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"The Fruit World and Market Grower," Melbourne, April, 1946, page 5, J. A. Beare.

Cheap Co-operative Liming in Warkworth

A HIGHLY-SUCCESSFUL co-operative effort by farmers in the district to ease the burden of liming and topdressing and at the same time reduce the costs of these operations is described in this article by P. S. Syme, formerly Instructor in Agriculture, Warkworth. An enterprise by which 13,000 tons of lime a year are at present made available to farmer-shareholders at 9s. a ton and may be spread for 5s. an acre must arouse the interest of other farmers who seek practicable means of reducing costs.

WHATEVER may be said about the farmer being an individualist in temperament, the story of successful co-operative enterprise shows very clearly that where necessary he can combine with others for the benefit of all. Co-operation has done much for the farmer, but that it can still do much more is the opinion of the Rodney Co-operative Dairy Company, which has consistently backed up its opinions by its policy.

Encouraged Use of Lime

Realising that increased production throughout the district was largely dependent on the general use of heavy applications of lime, the directors of the company decided, nearly 20 years ago, to convince the farmer that liming was profitable. In those days of low produce prices it was obvious that the increased use of lime could be fostered only if good-quality lime could be provided at a price which the farmer could well afford. Accordingly, in 1930, the secretary of the dairy company, Mr. C. C. Ellis, announced proposals for the Rodney Lime Company to be started in the district. The prime objective of the company was to provide cheap lime to the farmer; unlike most trading concerns it did not seek profits, and throughout its history its aim has been to serve the farmer with cheap, good-quality lime.

Consistently Successful

Starting with an output of 965 tons in 1931, the limeworks now has an output of 13,000 tons of lime a year and is one of the most modern and efficient plants operating in the country. Equally important to the farmer, its price still defies competition, averaging 9s. 11d. a ton bagged in farmers' own sacks during the past year, and 9s. a ton if bought loose in bulk.

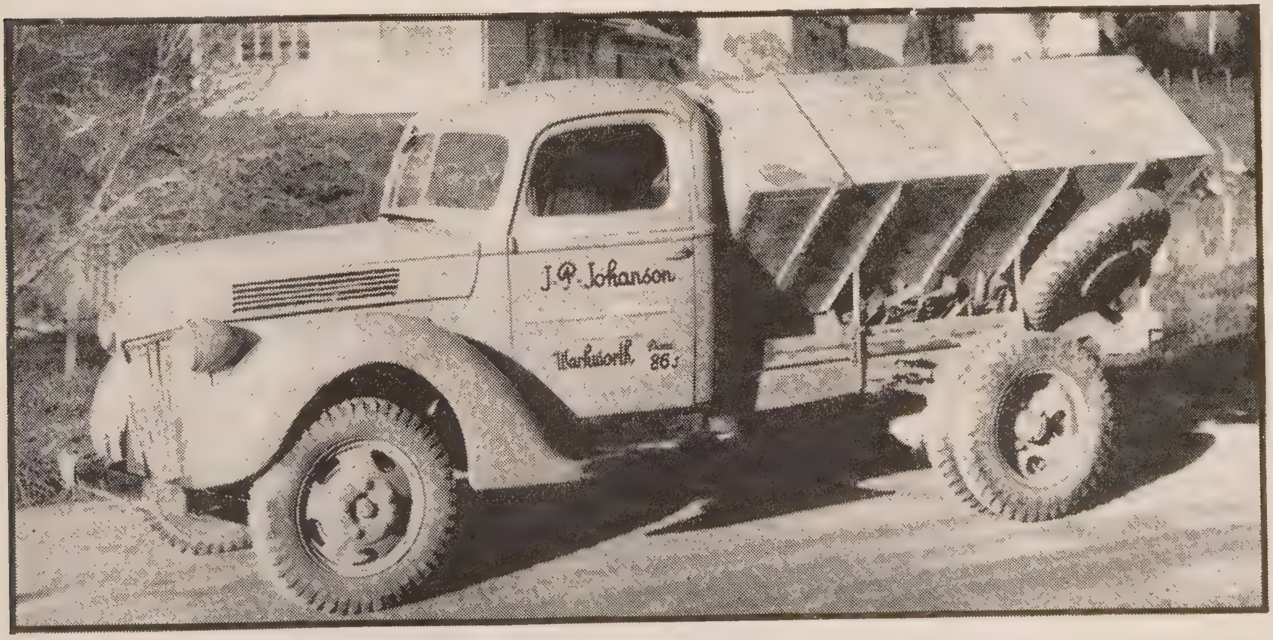
It should be noted that these prices are net and represent the actual cost after allowing for bags. Where else in New Zealand can the farmer buy good-quality lime at 9s. a ton? This low price is largely due to the policy of complete mechanisation which enables the working plant to be operated by three men and a boy.

Further Economies Possible

Realising that even further economies in the applied cost of the lime were still possible, Mr. Ellis, with the sponsorship of the far-sighted dairy company directors, recently started a new co-operative enterprise known as Rodney Fertilizer Distributors Ltd., which bids fair to complete the cycle of cheap lime from the quarry to the pasture.

Like the Rodney Lime Company, the new enterprise is essentially co-operative. The objective is to flatten out the high cost of applying lime and fertilisers and to pass the economies of large-scale operation on to the farmer. For some time past the directors of the dairy company have become increasingly conscious of the difficulties faced by the farmer in applying heavy and profitable dressings of lime or fertiliser, and they consider that this offers a fertile field for a new co-operative effort. If successful, it should appreciably reduce application costs and should relieve the farmer of a very arduous duty, permitting him to devote more time to the profitable management of his farm. It is hoped that this will result in more lime and fertiliser being used, and will in turn lead to higher all-over production throughout the district.

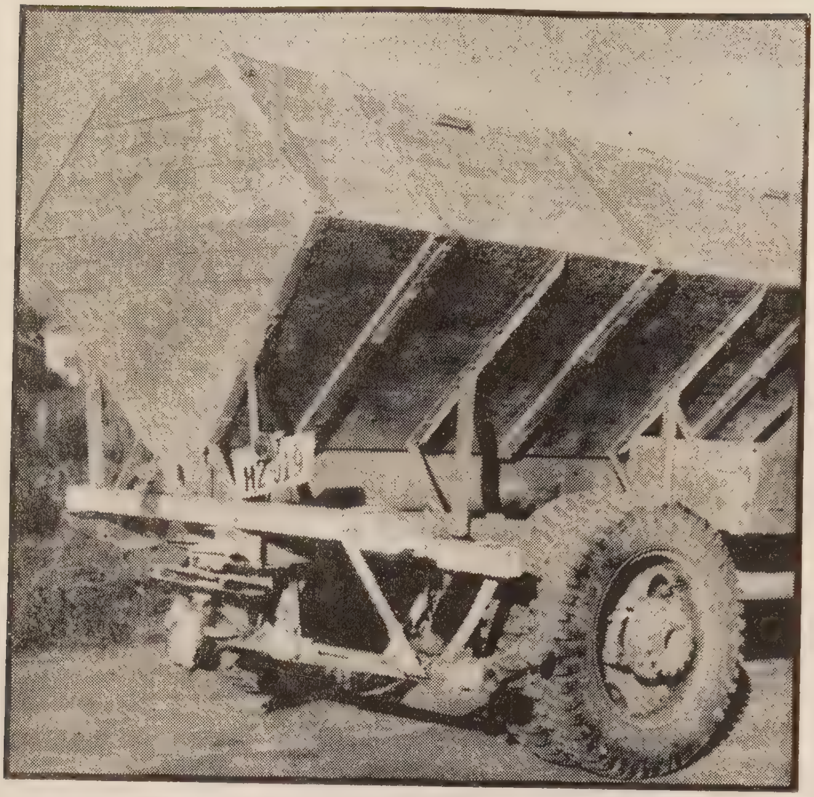
The policy of the company is to have every customer a shareholder, and each



[T. W. Collins photo.

The type of bulk distributor used. The truck collects a 4-ton load at the works, transports it to the field, and distributes it by a rotary spinner at the rear. During the past season the machines demonstrated their ability to sow on surprisingly steep ground at low cost, the rate charged for sowing lime being only 5s. a ton-acre.

CHEAP CO-OPERATIVE LIMING



[T. W. Collins photo.

The rear of the truck, showing the distributing mechanism.

prospective member must contribute a minimum of £10 or a maximum of £200 in £1 shares. With the capital so provided the company has acquired three specially-designed, bulk-cartage distributors, each capable of collecting the lime at the works, transporting it to the field, and distributing it. This permits the farmer to buy his lime at special bulk prices and cuts out any irksome costs and disputes concerning bags. It is estimated that the cost of spreading lime will be more than recovered in the price saved on bags alone.

Five Shillings an Acre

Lime or fertiliser will be distributed at a cost of 5s. per acre covered, road cartage being charged at ordinary rates from the works to the farm. The trucks will be operated by the company to a schedule prepared in advance, and the number of shares held will not in any way affect priority of distribution.

Mindful of the success of the lime company, applicants have eagerly subscribed for shares. It is anticipated that this season the new company will have been responsible for sowing in the Warkworth district about 13,000 tons of lime in addition to a considerable quantity of fertiliser.

The new company will have the services of the same secretary and many of the same directors as the Lime Company, and under wise leadership it is hoped it will yet have as good a record of service to the farming community.

It should be emphasised that the Lime Company succeeded because of wise and competent direction. Under competent leadership there is scope for many other enterprises which could not fail to prove of benefit and profit to the community. Without sound leadership, however, random, unconsidered enterprises with ill-appointed directors will almost inevitably fail, resulting in financial loss and disappointment as well as a setback to co-operative movements.

Others Can Do It

There must be many farmers throughout the country who would appreciate being able to buy their lime at 9s. a ton and get it spread at 5s. an acre. Through co-operation farmers can secure the advantages of lime at cost price. Warkworth has no special advantages over many other districts with lime deposits, and what has been done by Warkworth farmers can be done by farmers elsewhere who are willing to co-operate.

Seed Extraction with Hydrochloric Acid

THE hydrochloric acid method of extraction of tomato and cucumber seed was first introduced in Australia in 1943, and was thoroughly tested in New Zealand during the 1944, 1946, and 1947 seasons. It is simple, inexpensive, and efficient.

Seed extracted by acid is cleaner and brighter than that extracted by fermentation and has a consistently-higher germination. The method has the added advantages that the extraction time is reduced to three hours and that the process is independent of temperature.

Tomatoes

Well-ripened fruits of good shape selected from healthy plants which have set all trusses freely are best suited for seed production. Fruits should be cut at the blossom end so that each seed compartment is opened and the pulp squeezed into a wooden barrel or bucket. Metal containers should not be used, as the acid reacts with the metal, causing weakening of the solution and discoloration of the seed. Commercial hydrochloric acid is thoroughly mixed with the pulp at the rate of one fluid ounce of acid to the pulp from 5lb. of fruit, and the mixture stirred at approximately half-hour intervals while the acid is acting. After three hours water should be forced into the mixture through a nozzle or by placing a finger partially over the end of a hose. The pressure of water causes an agitation which assists in separating the seed from the seed coats and other unwanted material. The seed should then be allowed to sink to the bottom of the container, when the water is decanted off, the process being repeated a number of times until all waste material is removed. Remaining water should be removed by straining through muslin.

Clean seed should be spread thinly on newspaper and dried as rapidly as possible. Drying should not be done on metal, as contact with the metal will cause discoloration of the seed if any acid remains.

By the method described seed was extracted from over 4 tons of Potentate tomatoes in the 1947 season and germination averaged 94 per cent.

Cucumber, Passion Fruit, and Tree Tomato

For the extraction of cucumber, passion fruit, and tree tomato seed acid is used at double strength—2 fluid ounces are added to the pulp from every 5lb. of fruit. The method of treatment, washing, and drying is the same as that described for tomatoes.

To clean passion fruit seed completely it is necessary after washing to strain off the water through muslin, rub the seed together, and rewash. In this way the stringy tissue which attaches seed to the wall of the fruit is completely removed and a very clean sample of seed is obtained.

—By C. H. PROCTER, Plant Diseases Division, Department of Scientific and Industrial Research.

CONTROL OF DISEASES OF PREGNANT EWES

By M. C. ARMSTRONG, *Veterinarian,*
Department of Agriculture, Timaru.

THE four major nutritional diseases of pregnant ewes—abortion, bearing trouble, sleepy sickness, and milk fever—are described and discussed in this article to show how each disease is related to certain feed management conditions which can be prevented. Sheep farmers are presented with sound, practical facts that may assist them to organise a system of feed management designed to control the condition of the pregnant ewe and keep all these diseases at a minimum.

AS the diseases discussed are directly related to nutritional needs of the pregnant ewe, knowledge of some facts about the pregnant ewe is necessary to the discussion.

The average duration of pregnancy in the ewe is 21 weeks.

It is known that in controlled experiments birth weight and vigour of the lamb are reliable indications of the nutritional health of the ewe during pregnancy. It was found that ewes well fed during the last 6 weeks of pregnancy produced lambs very much heavier than those from poorly-fed ewes. Not only were their lambs stronger and more vigorous, but they also fattened much more quickly, and the ewes had bigger udders and milk yields.

At the end of the first three months of pregnancy the unborn lamb is still small and averages 1.7lb. in weight. It was surprising that at the end of the third month of pregnancy the unborn lamb of a fat, well-fed ewe was no heavier than that from a poor-conditioned ewe, and it was therefore concluded that the level of the diet during the first three months of pregnancy had little effect on the birth weight of the lamb. It was observed, however, that the level of feeding over the last 8 weeks of pregnancy had a profound effect on the size of the lamb at birth.

Experimental results were:—

Feeding variations of ewes	Average birth weight of lambs lb.
1. Ewes well fed throughout pregnancy	11.3
2. Ewes poorly fed, then well fed the last 8 weeks ..	11.1
3. Ewes poorly fed throughout	5.8
4. Ewes well fed first, then poorly fed for last 8 weeks ..	6.5

Note that 2 compares favourably with 1.

Two lots of ewes carrying twins gave the following results:—

Feeding variations of ewes	Average birth weight of twins lb.
1. Ewes fed high during last 6 weeks of pregnancy ..	10.7
2. Ewes fed low during last 6 weeks of pregnancy ..	5.7

Lambs Born Dead

It is known that low birth weights are associated with high death rates of lambs at lambing and slow rates of lamb fattening. Losses of lambs at lambing are definitely higher in ewes deprived of adequate feed during late pregnancy. If ewes in early pregnancy are kept thrifty and then allowed to rise slowly as pregnancy advances, lambs will be born with excellent birth weights and vigour.

Abortion in Ewes

(For the purpose of this article an abortion is defined as the expulsion of a dead, immature lamb.)

Early abortions in ewes are usually undetected, and investigations in recent years indicate that abortion may cause greater loss than is generally presumed, as it is a likely cause of the majority of dry ewes at lambing time. (The other possible cause of a low lambing percentage is sterility, which will not be discussed in this article.)

Occurrence

Abortion can occur in all breeds and ages of ewes on all types of country. Poorly-developed two-tooth ewes are

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Photograph used in heading illustration by Sparrow Industrial Pictures Ltd.

most susceptible, and abortion is a common cause of low lambing percentages in this class. Old ewes and twin-bearers are commonly affected where feeding practice is poor. In New Zealand abortion of ewes appears to be mainly a disease of poor condition.

Outbreaks are commonly reported after droughts or prolonged periods of deficient feeding or in seasons of unusual feed shortage during pregnancy. An incidence of up to 50 per cent. abortions can occur in two-tooth ewes.

Causes

The chief predisposing cause of abortion of ewes in New Zealand is poor nutrition—poor either in quantity or quality. Poor-quality nutrition commonly occurs with unbalanced feeding such as prolonged grazing on roots without green supplements. Under these conditions the ewe cannot obtain sufficient of the foods essential for herself and the unborn lamb.

A frequent precipitating factor in poor-conditioned ewes is internal injury caused by rough handling or physical violence.

Prevention

Ewes not in robust condition need more careful handling when being mustered, crutched, drenched, or vaccinated. A poor-conditioned flock has to be handled with far more care than a fit flock.

Every attempt must be made to hold pregnant ewes in fit condition. During the first three months of pregnancy two-tooth ewes require more care in feeding, because they still have to develop and mature. During the last two months of pregnancy ewes of all ages require a gradual build up in nutrition if abortions are to be prevented. They will require additional feed during bad weather, and periods of fasting, such as time spent in yards, should be reduced to an absolute minimum.

Ewes fed root crops require vitamin supplements of green fodder such as grass, kale, or chou moellier; a poor grass run-off is quite insufficient.

It is sound practice not to breed from poorly-developed two-tooth ewes, but to mate them as four-tooths instead. The majority of high-country sheep farmers defer the mating of two-tooth ewes until the following season so that they are well developed for breeding.

Bearing Trouble

In some seasons bearing trouble or eversion of the vagina can cause considerable economic loss and extra work just before lambing.

Symptoms and Description

Eversion of the vagina of the ewe is readily identified. The displaced organ shows as a red or purple tumour below the anus. The size of the tumour varies according to the duration of the accident and the state of the bladder. As the vagina has turned inside out, the surface of the tumour has the same smooth texture of the vaginal surface.

Affected ewes are dull, uneasy, and lag behind a moving mob. During a period of straining the everted organ appears as a red tumour which increases in size and darkens because of strangulation of the circulation. Its outer surface is smooth and the extremity has an orifice. The bladder is commonly involved inside the eversion in such a way that urinary strangulation occurs, resulting in distension of the bladder and expansion of the tumour.

If the case remains untreated, straining and pain lead to exhaustion followed by death.

Occurrence

Eversion occurs most commonly within one month of lambing. In certain seasons it may occur in almost epidemic proportions in many districts of New Zealand. It is favoured by seasons of unusual feed abundance during pregnancy, and is therefore prevalent in seasons of good autumns and winters when feed is rank and plentiful.

All breeds of sheep appear to be susceptible under the same feed conditions. Most outbreaks, however, occur in the breeds and crosses commonly grazed on good hill country or lower grasslands. Pure Merinos, generally grazing under poor conditions, are rarely affected, especially the type with a short, blocky carcass and a wide pelvis. Though most cases occur in ewes carrying twins or triplets, the trouble can affect ewes with only single lambs.

Affected ewes are usually fat instead of in a fit condition on the approach of lambing, and they usually take a minimum of exercise.

Though most cases of eversion occur with a fat, mature type of ewe carrying twins and lacking in exercise, the disease can also occur under other conditions where some of these factors do not exist.

Outbreaks can occur after prolonged feeding on turnips or on fibrous diets such as wheat or pea straw.

The trouble is more common on farms where insufficient cattle are kept to control pasture top.

Incidence

In bad seasons average incidence may be 5 per cent., though some flocks may have 10 per cent. of ewes affected.

The majority of cases usually die from blood poisoning or uraemia (retention of the urine). Treated cases often have dead lambs.

Causes

There is no evidence to suggest that an infective parasite may be responsible for eversion and the cause still awaits a satisfactory solution.

Two distinct theories have been postulated:

1. **Bladder origin:** It is thought that fat, contented ewes with full paunches are apt to lie down for a long period during which an accumulation of urine may cause a bladder spasm that induces straining.
2. **Devitalised tissues:** The vagina is retained in normal position by ligaments and muscles. Fatness or unfitness weakens these retention structures so that a high abdominal pressure could force the vagina out of position. A full, fat ewe near lambing has a high abdominal pressure.

At the present state of knowledge neither theory can satisfactorily explain the disease as it occurs under all circumstances.

Treatment

Careful early attention to return the everted organs and retain them in position to prevent infection is essential to promote recovery.

First step in returning the organs is to relieve the bladder by pressing the everted mass upward and inward with the palm of the hand. Then the ewe's hindquarters should be raised either by placing her gently on her back on sloping ground or by suspending the hind legs. The eversion is then gently cleaned and a lubricating disinfectant applied. (A recommended percentage of a recognised proprietary disinfectant in liquid paraffin would be suitable.)

Replacement of the tumour requires patience. Careful squeezing with the palms and frequent applications of water will reduce the size of the mass until it can be returned to its normal position. The replaced organs must then be retained in position by approximating the lips of the vulva by the insertion of two safety pins or two tape sutures or by tying locks of wool from either side. Another method used with success is the placing of a small lemonade bottle in the vagina and tying the neck of the bottle by string to the wool.

All treated cases should be kept under strict supervision, because on the first sign of lambing retention devices must be removed.

Prevention

It is evident that eversion is only a symptom of the condition of a ewe which has to be prevented. If cases of eversion occur, grazing of the ewe flock must not be checked drastically, as this may precipitate a serious loss from sleepy sickness.

Prevention is attained by keeping the ewes fit and thriving during the first 3 months of pregnancy, when, if they carry too much condition, liability to disease is increased, and by ensuring that the ewe flock is regularly exercised in the last 2 months of pregnancy.

Pasture management should aim at the control of rank feed in good seasons. Cattle are excellent controllers of bulky roughage and should be more extensively used for pasture control on good grass farms.

Until more precise information is available on the effect of hereditary factors or body shape on the incidence of eversion it is sound practice to cull all affected ewes and not to keep their progeny for breeding.

Sleepy Sickness

Sleepy sickness, ante-partum paralysis, or pregnancy toxaemia, the commonest and most expensive disease of

[Sparrow Industrial Pictures Ltd. photo.

Exercise of the ewe flock regularly enforced is a recommended counter-measure for eversion and other troubles of pregnant ewes, but it should not be overdone, as excessive fatigue or rough handling during mustering may precipitate sleepy sickness or abortion.

the pregnant ewe, occurs during the last 6 weeks of pregnancy. In about 90 per cent. of cases of the disease the ewe is carrying twins or triplets. Maiden ewes are seldom affected and susceptibility to the disease increases with age. All breeds of sheep can be affected.

Symptoms

The major symptom is a slowly-developing paralysis which in typical cases runs a course of one week before death. It is important to distinguish this type of paralysis from milk fever paralysis, which is rapid in onset and is characterised by rapid coma and death within two days.

Early signs of sleepy sickness are loss of appetite, dopiness, and impaired sight. Affected ewes are dull, dopy, off their food, and lag behind the flock when driven. The eyes are fixed and sightless, though they still appear clear. Increasing blindness and greater loss of control of limbs force ewes to lean against or stagger insensibly into objects and to go down. Considerable thirst often attracts them to creeks and water holes where many drown.

Dopiness is followed by unconsciousness, paralysis, and coma, with death after several days of gradual deterioration.

Usual post-mortem findings are pale yellowish liver which is soft, fatty, and easily broken; the internal fat has a speckled appearance and the urine tests reveal an abnormally-high acetone content. Other organs appear normal and twins are usually found in the uterus.

Critical Period of Pregnancy

It is evident that the critical period of pregnancy in the ewes is the last 6 weeks before lambing, during which drastic alteration in the feed supply can result in a fatal functional disturbance of the system. The food demands of the ewe are greatest during this period, because over half of the lamb's birth weight has yet to grow, udder development for lactation occurs, and loss of body heat is usually greatest because of colder weather.

Ewes most susceptible to sleepy sickness in the critical period are those in good to fat condition and bearing twins or triplets.

Causes

A feed check causes the ewe to draw on her body fat for energy and vitamins, and the liver, lacking in glucose and vitamins, can convert the fat only as far as poisonous acetone derivatives. A highly-poisonous concentration of acetones accumulates in the blood to set up the characteristic symptoms of dopiness, blindness, staggers, and paralysis.

Immediate causes of sleepy sickness are conditions which impose a nutritional check during the last 6 weeks of pregnancy, which may be the result of any of the following:—

1. Lack in quantity or quality of the feed supply.
2. Severe cold, snow, or long wet spells.
3. Diseases affecting appetite and welfare, such as foot-rot, pink eye, parasites, or mouth and teeth troubles.
4. Excessive fasting or fatigue during mustering, droving, or transport.

Results of experiments indicate that any sudden reduction in food intake over a few days during the critical period of pregnancy of ewes previously well fed is very risky.

The disease often occurs in ewes slowly falling in condition during unbalanced feeding, such as a prolonged diet of only roots.

It is significant that the disease rarely occurs when sheep have access to greenfeed.

Treatment

Results of treatment are often disappointing and treatment is advisable only in the early stages of cases that can still move about. All ewes that lag behind when driven should be treated as suspected cases and given molasses and extra feed, preferably greens. If the ewe can swallow, a drench of ½lb. of molasses given carefully twice daily in water is of value, and 3oz. of Epsom-salt is a recommended addition to the first drench.

If swallowing is uncertain, the alternative advised is injection under the skin or into the rectum twice daily of a solution of 6oz. of 20 per cent. glucose.

Outbreak of the disease can be arrested if a gradual change on to greenfeed is possible. On properties where no greenfeed is available hay with molasses may be fed.

Prevention

An adequate supply of greenfeed for the last 6 weeks of pregnancy is the ideal preventive, which may be prearranged by autumn sowing of oats (Algerian or Dun), barley (Cape or Black Skinless), or pastures (Italian or short-rotation ryegrass and Montgomery clover or perennial ryegrass and white clover). Greenfeed thus provided should be in addition to thousand-headed kale, chou moellier, or lupins, which are used mostly for winter feeding. In dry areas such as the Mackenzie Country and other parts of the South Island ryecorn is a useful crop, giving a large bulk of nutritious green leafage.

Where greenfeed cannot be provided the alternatives are:—

1. To reduce the number of stock carried and to spell special paddocks.
2. To provide hay or dry feed concentrates—meat-meal nuts, chaff, oats, etc.

Where hand feeding can be economically practised good shepherds settle the flock to the feeders well before the critical period.

It is essential to attempt early control of foot-rot, pink tye, and scabby mouth diseases.

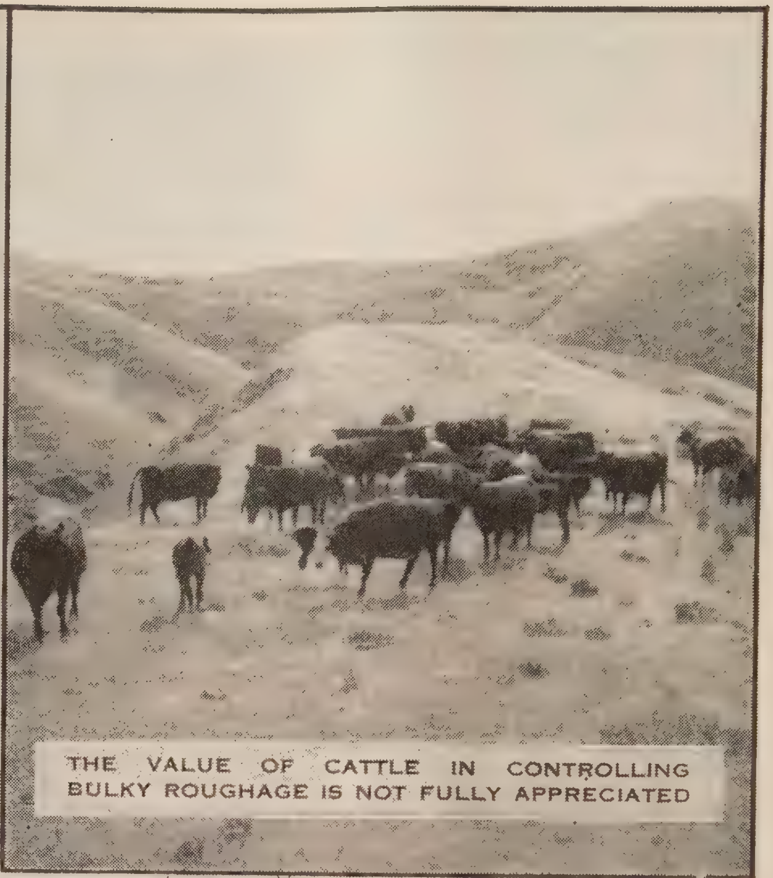
Where ewes are shorn in winter a feed supply adequate to counteract a check caused by cold conditions is essential.

Milk Fever of Ewes

Great care is necessary to distinguish milk fever of ewes, which commonly occurs in the last 6 weeks of

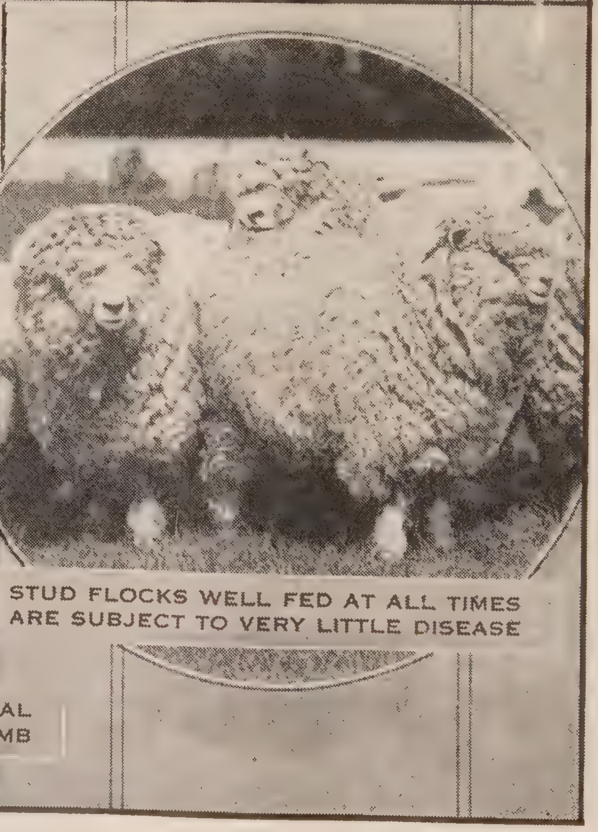
GRAZING MANAGEMENT OF FLOCK EWES

Good, steady feed before and after lambing is essential for flock ewes. Prolonged grazing on roots without green supplements can be avoided by prearranged autumn sowings of green fodder crops to be fed to ewes in the last 6 weeks of pregnancy, and for the control of pasture top and bulky roughage cattle could be more extensively used on good grass farms.



THE VALUE OF CATTLE IN CONTROLLING BULKY ROUGHAGE IS NOT FULLY APPRECIATED

ROOTS ALONE DO NOT SUPPLY ESSENTIAL FOODS FOR THE EWE AND HER UNBORN LAMB



STUD FLOCKS WELL FED AT ALL TIMES ARE SUBJECT TO VERY LITTLE DISEASE

[*Photograph in circle by "The New Zealand Farmer."*

[*Internal Affairs Department photo.*

Flock management directed toward maintaining ewes in fit and rising condition on a well-balanced diet from tupping to lambing, with special care to avoid sudden changes of feed or extremes of fatness or poorness at any stage of pregnancy, will ensure a minimum of diseases of ewes and help toward high lambing percentages.

pregnancy, from sleepy sickness. Both diseases affect older ewes more frequently than young ewes, and all breeds of sheep are susceptible. Though milk fever more frequently affects ewes carrying twins, it is quite common in ewes bearing only one lamb.

Milk fever, unlike sleepy sickness, frequently affects poor-conditioned ewes. Outbreaks are usually sudden and all cases in a flock may occur within one or two days. Up to 30 per cent. of a flock have been affected.

Symptoms

The major symptom is rapidly-developing paralysis and coma, which in typical cases runs a course of one or two days before death. (Sleepy sickness develops slowly and runs a course of about 8 days.)

In the first stages of the disease an affected ewe may show an excitable, stilted gait or may appear tucked up and trembling. After a staggery phase rapid loss of control of limbs develops into a paralytic coma, during which the breathing is slow and shallow. The animal seems insensible to external stimulation and may appear dead. Its eyes appear fixed and glassy and stomach contents vomit out of the nostrils. The popular name of the disease is deceptive because there is no fever; on the contrary, temperatures are well below normal. Affected ewes die without a struggle.

On post-mortem examination no changes in body organs are apparent.

A major finding in investigation of the disease took place many years ago when blood samples from affected ewes showed that milk fever was associated with a rapid fall in the proportion of calcium in the blood. A certain concentration of calcium in the bloodstream is essential for correct body functions, and any fall below a normal level leads to a rapid display of symptoms of depression of functions. The exact nature of this interference with the calcium balance is still unknown.

Circumstances of Outbreaks

Most outbreaks before lambing occur in poor-conditioned ewes flushed too suddenly on greenfeed. The disease tends to be related to seasonal variations in the feed supply and occurs more frequently after bad winters. Ewes falling in condition are highly susceptible when submitted to a sudden change in diet or when confined too long in yards or given an overdose of exercise. Many cases before lambing occur in ewes that would have developed sleepy sickness if the poor diet had not been suddenly changed to luscious greenfeed. A safe middle course can be taken in these circumstances if during the first week of the new diet ewes are allowed on it only a few hours at a time.

Outbreaks of milk fever after lambing are commonest in flocks lambing in low condition and then allowed a sudden abundance of greenfeed afterward. Severe ewe mortality has occurred on many properties where prolonged feeding on turnips with an old grass run-off has led to an outbreak of sleepy sickness; the ewes have then been turned on to green oats and mortalities from milk fever have continued right through lambing.

Where ewe flocks have been on good, steady feed before and after lambing these diseases are not troublesome and they are rare in stud flocks fed well at all times.

Prevention of Milk Fever

If ewes in low or falling condition are to be given greenfeed, the amount incorporated in their diet should be only gradually increased. Ewes advanced in pregnancy should not be held in yards for more than a few hours at a time nor given exhausting exercise.

Treatment

The fact that treatment of milk fever is generally very successful assists shepherds in distinguishing the disease from sleepy sickness. Two methods of treating milk fever are general:—

1. **Udder inflation:** Air is pumped into the udder until it is firm and then the teats are tied for two hours. In urgent cases this is a very satisfactory method of treatment both before and after lambing, and is often the most convenient to try first.

2. **Calcium injection under the skin:** Calcium treatment is more effective than udder inflation in cases occurring before lambing. Effects are rapid and certain and bad cases can recover completely in half an hour. Farmers are advised to consult their nearest veterinarian for the specific details of this method.

The feeding and management programme has to be carefully planned to counteract variations in feed supply which may have a disastrous effect on the pregnant ewe flock. From tupping time to lambing the ideal at which to aim is to maintain ewes in fit and rising condition on a well-balanced diet, with special care to avoid sudden changes of it or extremes of fatness or poorness at any period of pregnancy.

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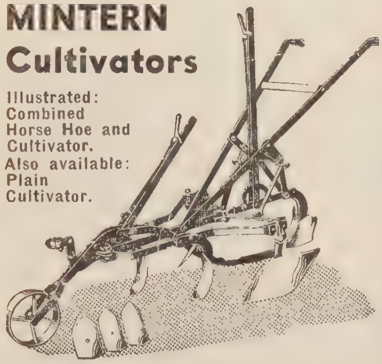

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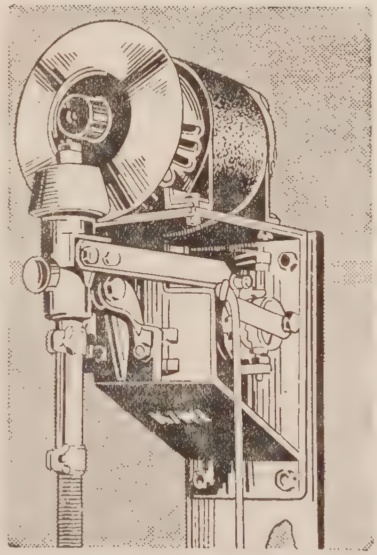

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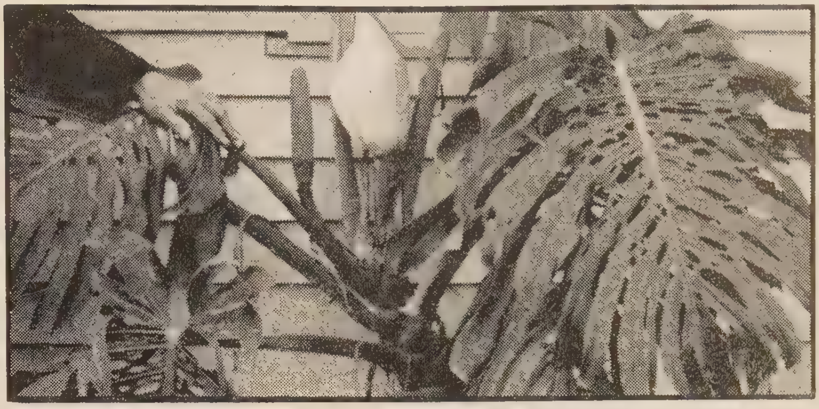
Monstera deliciosa—An Outstanding Ornamental Fruiting Plant

By P. EVERETT,
Orchard Instructor, Kaikohe.

MANY single plants of *Monstera deliciosa* are growing in private gardens in different parts of Auckland Province and to a limited extent in other provinces. In suitable localities the plant makes vigorous growth, crops freely, and bears fruit of excellent quality. Plants grow readily in large tubs, which can be placed in sunporches, on verandas, or under the spread of large evergreen trees where adequate protection from damaging temperatures can be given, though this method restricts growth and crop. Apart from the unique, delicious fruit which it produces, this plant is deserving of much wider cultivation in the Dominion for ornament.



[*Sparrow Industrial Pictures Ltd. photo.*

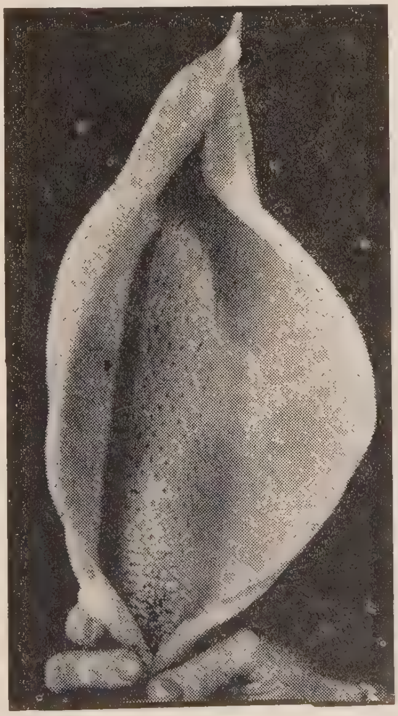
THIS uncommon evergreen plant of the arum family is a native of Mexico and grows in many tropical and sub-tropical countries. It has a large, fleshy, climbing stem about 2 to 2½in. in diameter which branches as the plant matures. The large leaves are extremely ornamental. being broad, long petioled, perforated, deeply incised, leathery, and up to 2ft. or more long. The petioles (leaf stems) are about the same length as the leaves and stand erect, with the leaves at right angles to the petiole. The vine will cling to any suitable support by its numerous strong aerial roots and is usually trained up a wall or strong post. When no support is provided the vines extend several inches above the ground, supported by the roots which continue to develop as the vine extends.

Flowers and Fruit

The flowers are similar to those of the arum lily but have a green spadix enclosed in a waxy white spathe. The flower usually appears in March or April and the spadix develops into a fruit about 10in. long with a diameter of 2½ to 3in. at the base and 2in. near the apex. The fruit reaches maturity 12 to 16 months after blossoming, so newly-opened blossoms and fully-developed fruits are often on the vine at the same time. Well-grown plants begin to bear fruit about three years after being planted out.

The fruit is covered with numerous hexagonal scales, and when these begin to fall off the fruit is almost ready for dessert use. The pulp of the fruit is arranged in hexagonal wedges attached to the core and when ripe has a delicate aroma and delicious, sweet taste. It is claimed that several flavours resembling those of other popular tropical fruits can be tasted in the pulp, giving rise to the names "fruit salad plant" and "fruit of all nations." The fruit is eaten fresh and makes an excellent ingredient for fruit salads. The pulp contains crystals of calcium oxalate, which to some people cause a temporary burning or pricking sensation to the tongue and throat, but most people are extremely appreciative of this fruit.

The plant is frost tender, but a temperature of about 30 degrees F. (two degrees of frost) will cause only slight injury to the more exposed leaves. It is more suitable for garden cultivation than for commercial plantings. Luxuriant growth is made in a well-sheltered, moist, hot climate and it will adapt itself to a wide range of soil conditions. A well-drained, rich, loamy soil to which has been added a liberal supply of decayed vegetable matter will probably give greatest plant vigour.



[*Sparrow Industrial Pictures Ltd. photo.*

Propagation

As seeds are seldom produced, *Monstera deliciosa* is usually propagated by cuttings. Branches from 4 to 12in. long, severed at the point of contact with the parent vine, make excellent cuttings, but shorter or longer branches can be used. Mature vines can also be used for this purpose, cut into sections of 4 to 6in., each with several joints. The pieces are laid lengthwise in the propagating bed, the upper surfaces of each section being about 2in. below the soil surface. Cuttings will develop roots rapidly at any time of the year if propagated in a glasshouse in a warm, humid atmosphere, but where no glasshouse is available cuttings should be taken during October, when soil temperature will be more favourable for root development than during winter and early spring. The propagating bed should be sheltered and warm, and a soil containing at least half coarse sand will give the best results. It is not necessary or desirable to remove the foliage from cuttings, as the leaves will remain fresh for several months under favourable conditions.

The only disease or pest known to attack the plant or fruit under New Zealand conditions is the common species of thrip (*Heliothrips haemorrhoidalis*), a minute, black insect which may injure the foliage and cause a silvered, scurfy appearance. Control is readily secured by spraying with nicotine sulphate at a dilution of 1½ teaspoons in 1 gallon of soapy water.

Reference: The Agricultural Gazette of New South Wales, January 1, 1942, pages 23 and 24, H. W. Eastwood.

Simple Method of Straightening Baling Wire for Re-use

By **P. S. SYME,** *formerly Instructor in Agriculture, Warkworth.*

WITH baling wire costing about £86 a ton when it is procurable, farmers will be interested in a simple and effective method devised by Mr. C. J. C. Grant for utilising old baling wire on his farm at Matakana, Auckland. Judging by a demonstration, his method is both simpler and faster than others that have been devised and, apart from the bench and vice found on every farm, all that is needed is an old harrow tooth to act as a lever and a short piece of 1in. timber to serve as a fulcrum.

THE piece of timber is nailed to the bench so that its outside edge is 8ft. 8in. from the edge of the vice. To straighten a wire about 1½in. of the plain end is gripped in the vice. The end with the loop is pulled along the bench toward the fulcrum slat and the loop passed through an appropriate hole in the harrow tooth, being held in position by a 4in. nail. Pressure is then applied to the top end of the lever, with the other end pressing against the slat.

When subjected to a steady, even pull, bends straighten out surprisingly well even though the wire might have been so bent and twisted as to seem beyond all hope of salvage. The test for a sufficient strain is that when released the wire should lie straight and flat against the bench like a new wire.

Tested for Strength

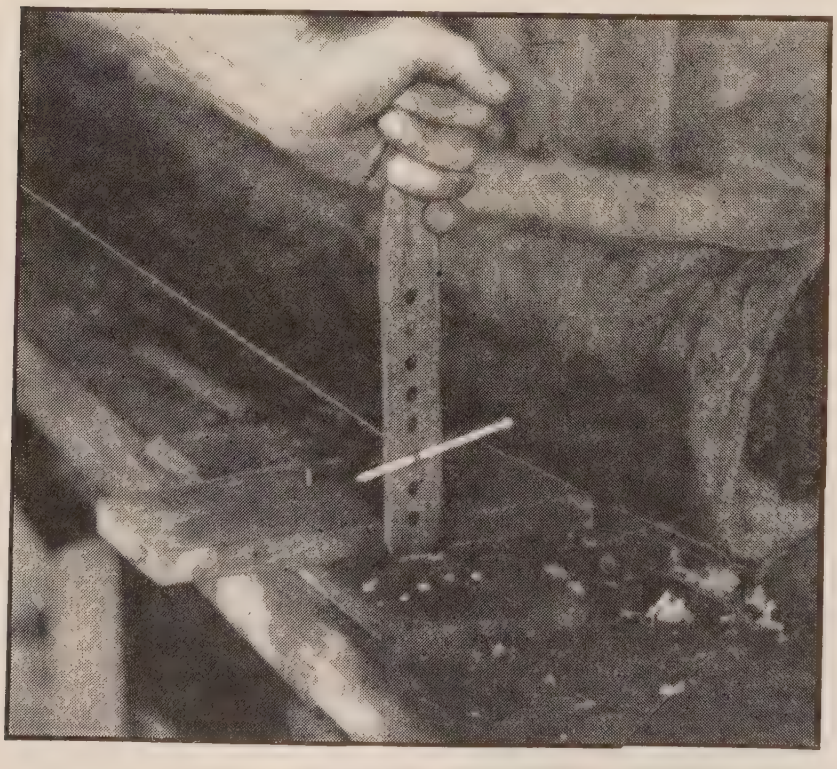
Mr. Grant points out that this method not only straightens the wire quickly and simply but also tests its fitness for re-using, because any wire which withstands the tension is proved fit to withstand the strain imposed in tying a bale. When a wire breaks in the straightening process it is cut off about 12in. from the looped end and saved for use as a short end in baling.

During the past season Mr. Grant anticipated the wire shortage and made a practice of taking home the old wires when feeding out hay. To salvage them required only a few minutes, the straightened wires being placed along the back of the bench, where they occupied little space and were out of the way. When about 500 had accumulated they were laid on a length of sacking, given a generous coat of old engine oil, and rolled into a neat bundle which could be stored conveniently ready for the haymaking season.

Independent of New Wire

Working in this way, Mr. Grant has accumulated sufficient wires for 700 bales—enough with his carry-over of hay from last season to make him independent of buying new wire. These wires are all perfectly straight and to the eye indistinguishable from new.

Apart from the appreciable saving to his pocket, Mr. Grant, unlike most dairy farmers, has had no worry about procuring baling wire and has had the satisfaction of saving a material in critically-short supply.



An old baling wire being straightened while held in a harrow tooth by a 4in. nail through the loop. The other end is held firmly in a vice. Bundles of salvaged wires, rolled in sacking and coated with old engine oil, are lying along the back of the bench.

Veterinary Science Bursaries

BECAUSE of the many students who are applying for veterinary science bursaries the Veterinary Services Council has decided that in the immediate future bursaries should be granted only to applicants with outstanding academic and practical qualifications and personality suited for the profession. There has been a great demand for qualified veterinarians in New Zealand during the past few years, but the council considers that, with the arrival of several veterinarians from Britain in the last year, and the recent return of 12 students after graduation at the Sydney Veterinary School, the most urgent needs have been met. Though many districts are not yet adequately covered, a skeleton service at least is being provided for the whole Dominion.

As it is expected that there will be 76 New Zealand students in training at Sydney this year (34 under Rehabilitation Department grants, 29 under the council provisions, and 13 paying their own way), and replacement of veterinarians in New Zealand will be low on account of their low average age, the council considers that those of the present students who graduate will be sufficient to bring the service up to full strength and that future bursaries, including any to be granted through the Rehabilitation Department, should be limited to a few each year. A very limited number of students should be sufficient for replacement purposes and could probably be accepted at Sydney without danger of overcrowding, which is making it necessary for the university authorities to restrict admissions at present.

PLANNING PIG PRODUCTION FOR THE DAIRY FARM

By A. LONGWILL, *Assistant Superintendent of the Pig Industry, Wellington.*

IN NEW ZEALAND, where pig production is dependent on dairying for its economic existence, careful planning of production is more necessary than in countries where the industry is based on a storable grain-feed supply. Not only must the New Zealand pig producer provide to utilise a feed supply which fluctuates widely, but he must be on guard against abnormal fluctuations. He must not be caught with an insufficient number of pigs to consume an extra flush of milk in the spring months without wasteful overfeeding, nor, if a drought curtails the dairying season, must he be forced into sacrificing light, unfinished pigs with the consequent risk of condemnations through emaciation.

IN countries where a storable feed supply is available in adequate amount the system developed has been to spread farrowings so that a fairly uniform population and output of pigs is obtained. Capital and labour in relation to throughput are thus minimised and efficiency of production is improved.

In New Zealand various practices have been developed to adjust production to the basic feed supply. Briefly, these practices are:—

1. Taking only one litter a year from a large proportion of sows. This is a contributory factor to the low number of pigs slaughtered per sow in this country, 9 or 10, compared with 16 to 18 in more intensive pig-producing countries.

2. Killing the bulk of the pigs (mainly as porkers) in the late summer and autumn as the supply of dairy by-products declines.

3. Killing light and unfinished pigs at the end of the season. Many such pigs are condemned because of emaciation.

In more recent times, particularly under the spur of low prices for farm products during the depression, more intensive pig husbandry practices developed, including the growing of crops for wintering pigs.

These crops enabled store pigs to be wintered economically and ensured that sufficient pigs were available in spring to cope with the flush of milk. The demand for baconer pigs during the war stressed the necessity for cropping, but there has always been a reluctance on the part of the dairy farmer to sacrifice what he considers good dairy-cow pasture to provide supplementary food for pigs. This is not unnatural in view of the experience in most dairying areas of New Zealand that efficient grassland management gives the best production results from the dairy herd. Thus the dairy farmer has neither the equipment, experience, nor inclination to grow high-yielding, and therefore cheap, farm crops for pigs.

Further doubts on the desirability of crops for wintering stores were aroused when it was found that the pigs were nine or ten months old when ready to go as baconers, and much care in feeding during the finishing stages was necessary to ensure good grading results.

New System of Production

These factors have led to a different conception of the place of farm-grown crops in the pig-feeding programme. The new system aims at minimising the number of store pigs carried through the winter, concentrating farrowings in May and June, and using the crops, which should be mainly of

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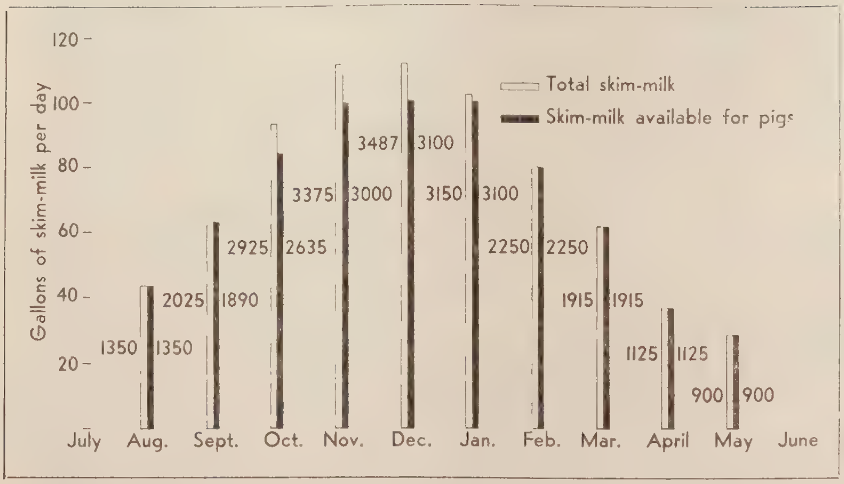
Photograph in the heading by "The New Zealand Dairy Exporter."

PLANNING PIG PRODUCTION



Daily quantities of skim-milk available for pig feeding from a 50-cow herd rearing 10 calves. The figures alongside each column indicate the total quantity of skim-milk per month.

TABLE 1—FOOD REQUIREMENTS OF PIGS ON A 50-COW HERD FARM

The itemised quantities of rations are shown as average per head, but the figures given for daily, monthly, and yearly totals cover the total requirements of all pigs on the farm.

	Stock on hand	Milk gal.	Meat Meal lb.	Cereal Meal lb.	Crop food unit *
MAY	4 sows:				
	1 and litter ..	8	1	2	2
	1 dry sow ..	4	½	2	4
	2 dry sows ..	2	—	1	3
	10 porkers (for 10 days)	4	—	—	2
	Daily total ..	29	1½	5	15
	Total for 31 days	899	46	155	465
JUNE	4 sows:	As available			
	2 with litters ..		2	5	4
	2 in pig		1	2	4
	Daily total ..	—	6	14	16
	Total for 30 days	—	180	420	480
JULY	4 sows:	As available			
	1 dry sow ..		1	1	5
	3 with litters ..		2	5	4
	7 weaners ..		½	1	½
	Daily total ..	—	10½	23	20
	Total for 31 days	—	325	713	620
AUGUST	4 sows:				
	2 dry sows ..	—	1	1	5
	2 with litters ..	10	1	1	2
	7 3-month slips ..	2½	—	—	1
	7 weaners ..	1½	½	—	½
	Daily total ..	43	7½	4	24½
	Total for 31 days	1333	232	124	760
SEPTEMBER	4 dry sows ..	—	½	½	5
	7 porkers ..	3½	¼	¼	½
	7 3-month slips ..	2½	¼	¼	½
	14 weaners ..	1½	¼	—	½
	Daily total ..	63	9	5½	34
	Total for 30 days	1890	270	165	1020
OCTOBER	4 dry sows ..	½	—	½	Grazing only
	6 porkers ..	4½	¼	¼	
	6 light porkers ..	3½	¼	¼	
	14 slips ..	2½	¼	—	
	Daily total ..	85	6½	5	—
	Total for 31 days	2635	200	155	—
NOVEMBER	1 sow and litter	4	2	6	Grazing only
	3 dry sows ..	—	½	1½	
	6 baconers ..	5	—	¼	
	6 heavy porkers	4	—	¼	
	14 light porkers	3	—	¼	
	Daily total ..	100	3½	16	—
	Total for 30 days	3000	105	480	—
DECEMBER	3 sows and litters	6	2	6	Grazing only
	1 dry sow ..	2	—	—	
	6 baconers ..	5	—	¼	
	14 porkers ..	4	—	¼	
	Daily total ..	100	6	23	—
	Total for 31 days	3100	186	713	—
JANUARY	1 dry sow ..	—	¼	¾	5
	3 sows and litters	8	1	2	2
	14 baconers ..	5	—	¼	½
	7 weaners ..	2	½	¼	—
	(Balance of baconers sold by end Jan. or early Feb.) ..				Rape, Kale or Lucerne
	Daily total ..	100	7	12	20
	Total for 31 days	3100	217	372	620
FEBRUARY	3 dry sows ..	6	—	—	2
	1 sow and litter	13	1	2	—
	7 3-month slips ..	3	¼	—	½
	14 weaners ..	2	¼	—	—
	Daily total ..	80	6¼	2	10
	Total for 28 days	2240	175	56	280
MARCH	4 dry sows ..	1	½	—	6
	7 porkers ..	3½	¼	—	1
	13 slips	2½	¼	¼	1
	6 weaners ..	1½	½	½	—
	Daily total ..	62	9	6½	40
	Total for 31 days	1922	279	200	1240
APRIL	4 dry sows ..	—	½	—	6
	13 porkers ..	4	—	—	1
	6 slips	2	½	½	½
	(Finished as light porkers at end of month)				
	Daily total ..	37	5	3	40
	Total for 30 days	1110	150	90	1200
	Totals for year	21229	2365	3643	6685

* 1 food unit = 10lb. of swedes, mangolds, kumikumi, rape, kale, etc., 8lb. of carrots, or 5lb. of sugar beet.

the high-quality type such as sugar beet, through the sows. Good farrowing accommodation, enabling full control over the sows and litters, is, of course, essential to this system.

Under present conditions of acute shortage of concentrated feeding stuffs some home-grown feed is essential to full utilisation of the dairy by-products. It is virtually impossible to produce the pigs necessary to consume the flush of milk without farm-grown crops to help bridge the gap between dairying seasons.

Farrowing in May and June (or two months before the bulk of the herd calves) means that the second litters are born in November and December, and thus the peak of demand for pig feed coincides with the peak of supply. When the demand exceeds the supply to the extent that the requirement of supplementary feed threatens to reach an uneconomic level the first litters are sold as baconers. The second litters are then carried on to pork weights.

It is at this stage that a further aspect of the home-grown crop provision becomes important. A second litter must be obtained to make full use of breeding stock, but the producer must avoid being in the position of having to market his pigs at a loss or, at best, without any profit. After December grass is of little food value to pigs, and unless lucerne is grown, the provision of some green crop such as rape or kale would seem to be worth while to ensure that full use is made of the declining milk supply in autumn and that the porkers sold are in prime condition right up to the end of the season.

Operation of New System

A practical insight into the working of the new system can be obtained by examining its application on a dairy farm carrying a herd of say, 50 cows, and rearing 10 replacement heifer calves. Four sows are carried, all pigs being fattened and an average of 13 pigs sold per sow, or better than one pig per cow. Though higher production is obtainable, particularly where herds yield higher quantities of skim-milk and where more supplementary foods are used, this case is fairly representative of what can be done, even under the present conditions of very restricted meal supplies, on a typical home-separation farm with a grade Jersey herd yielding an average of 500 gallons per cow.

The graph on this page shows the average daily supply of skim-milk for each month during the dairying season. The herd calves from the end of July onward, and is dried off at the end of May. The skim-milk available varies from practically none in June and July to 100 gallons per day for pigs, after requirements for calves have been met, in November, December, and January.

The way this milk supply is used and the supplementary feeds required, together with their monthly distribution, are shown in Table 1.

In studying Table 1 it is necessary to bear in mind that the four sows farrow at 3-weekly intervals from the

TABLE 2—DATES OF SALES OF PIGS

Date	Types of pigs	Total carcass weight
November 30	6 baconers, average 150lb.	900lb.
December 20	6 baconers, average 150lb.	900lb.
January 10	4 baconers, average 150lb.	600lb.
January 17	3 baconers, average 150lb.	450lb.
January 24	4 baconers, average 145lb.	580lb.
February 7	3 baconers, average 150lb.	450lb.
March 8	4 porkers, average 75lb.	300lb.
March 15	3 porkers, average 80lb.	240lb.
April 1	3 porkers, average 70lb.	210lb.
April 8	3 porkers, average 70lb.	210lb.
April 15	4 porkers, average 70lb.	280lb.
April 22	3 porkers, average 70lb.	210lb.
April 29	3 porkers, average 65lb.	195lb.
May 6	3 porkers, average 65lb.	195lb.
		5720lb.

first week in May, and that pigs are sold according to the order set out in Table 2.

Sales are in regular, small consignments so that difficulties in taking up the supply liberated by the disposal of pigs are minimised. Depending on the season, the dates of disposal and the weights of pigs sold would necessarily vary, but a level of between 45 and 50lb. of pig meat per 100lb. of butterfat should be attained and this is satisfactory on the level of supplementary feeding indicated.

Supplementary Feed Required

In the system outlined the supplementary feed required comprises 53½cwt. of concentrate quality and bulk foods to a level equivalent to 3 tons of feed. Where crops such as maize can be grown the necessity for purchase of supplementary feed could be restricted to 21cwt. of meat meal, but if all the concentrated food had to be purchased, it would still be economic to do so, even at the present high prices.

The creep of this farrowing unit is roofed over, thus ensuring that suckers can get access to supplementary feed without having to go outside in wet weather.

The bulk foods for use in autumn and winter periods should be as follows:—

Period	Bulk food	Amount tons	Area acres
January-April	Rape and/or thousand-headed kale, green maize	15	1
May-September	Sugar beet ..	7½	¼
	The cereal meal requirement can also be met by means of a home-grown crop of maize, barley, etc.		1 to 1½
			2¼ to 2¾

Thus, with good crop management sufficient supplementary feed can be grown on about 2½ acres, or a little more than ½ acre per sow. This system does not involve any more cropping than would normally be necessary for wintering stores, and is more efficient in converting food into pig meat.

Points in Favour of System

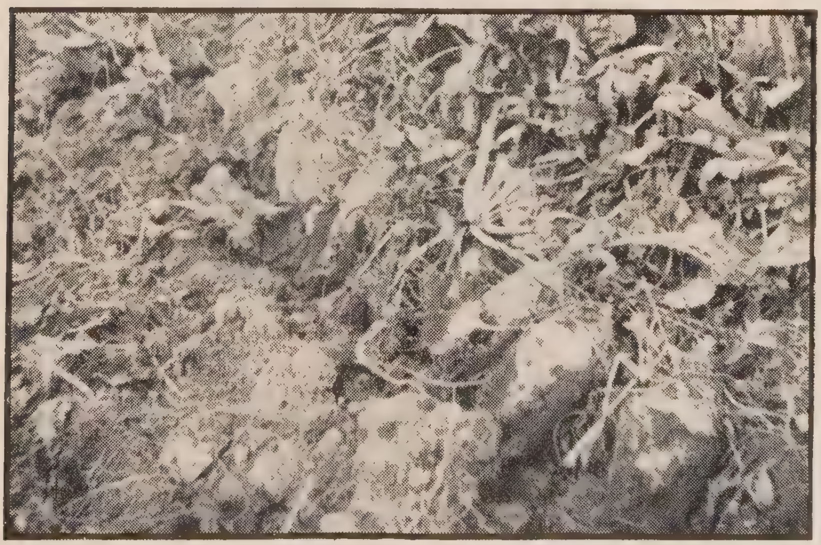
Other points in favour of the system may be summarised as follows:—

1. With May-June farrowings it is possible to give individual attention to sows at farrowing time that would not be possible at busier times of the year. Farrowing is a critical time and the weather is frequently better at this time than it is in the following two or three months. Housing conditions must, of course, be good to enable full control of the sow and litter during the winter months.

2. Considerable amounts of concentrated feed are required to supplement the sow's feed during the winter months and to start the young pigs. The amounts indicated in Table 1 are suitable and no attempt to reduce these should be made. Meals are used more economically this way than any other.

3. The food requirement of the pigs is fitted to the natural fluctuation of dairy by-product supplies and thereby reduces total supplementing to the minimum in proportion to output of pig meat. The baconers are not only finished at an earlier age, but with the second litters coming along the larger number of pigs available to cope with the flush of milk enables a restricted ration to be fed to the baconers in the finishing stages, which results in a beneficial effect on grading.

4. Compared with either buying in stores to consume the flush supply of skim-milk or conserving curd in the flush for use in the winter, this system is capable of showing not only greater output but more net profit.



It is essential to grow some food to bridge the gap in feed supplies between dairying seasons. Sugar beet is the most suitable crop for pigs and will produce more feed per acre than any other crop.

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LIVER FLUKE IN SHEEP

IN areas where sheep become infested with liver fluke flocks should be drenched now. The only effective drug is carbon tetrachloride, which should be mixed with four times its volume of liquid paraffin. The dose of the mixture is 5 c.c. for sheep of all ages, and 1 gallon is enough for about 900 sheep. If only one treatment is to be given, the middle of June is the best time, but if sheep are already showing symptoms, a drench should be given immediately and repeated at the end of July. Further information about liver fluke in sheep and cattle is contained in an article in the February, 1945, issue of the "Journal" which is also available from all offices of the Department as Bulletin No. 248.

[*Green and Hahn Ltd. photo.*

RICKETS IN LAMBS

Lambs fed on green oats or green barley during winter, especially in Canterbury and some other districts of the South Island, sometimes suffer from lameness which is due to rickets. This can be prevented by giving one dose of vitamin D at the beginning of winter. The best preparation is calciferol, and the dose is 25 milligrams dissolved in the smallest amount of olive oil which can be conveniently given with the drenching apparatus available. This treatment, besides preventing rickets, will ensure better growth in lambs grazing on green oats or barley. Further details and valuable advice on the winter feeding of hoggets in Canterbury may be found in the December, 1946, issue of the "Journal."

[*Green and Hahn Ltd. photo.*

LICE ON POULTRY

Infestation of poultry with lice can cause considerable loss of condition of birds and reduced egg laying. To control lice a fine trickle of 40 per cent. nicotine sulphate should be run along the perches on a cool night before the birds go to roost. Two or three treatments should be given at weekly intervals.

* * *

WORMS IN LAMBS AND CALVES

Worms are sometimes still troublesome in May and June, and if lambs or calves are not doing well, they should be drenched with phenothiazine at the full dosage rates recommended by the manufacturers. Further information about worms and drenching is contained in the article "Phenothiazine" in the July, 1944, issue of the "Journal" (reprinted as Bulletin No. 189) and the article "Internal Parasites of Sheep" in the May, 1945, issue of the "Journal" (reprinted as Bulletin No. 171).

[*"The New Zealand Dairy Exporter" photo.*

Plant Hormone Inhibits Sprouting of Stored Potatoes

By J. H. CLARIDGE, *Agronomist, Wellington.*

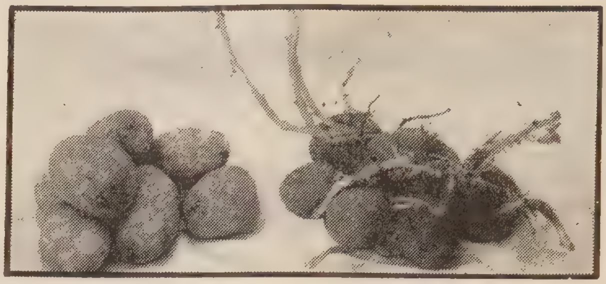
THE storage of potatoes to meet requirements in the later months of the year always presents a problem because of the natural tendency of the tuber to begin growth after the resting period subsequent to harvest. Sprouting brings about a softening and shrivelling of the tuber associated with appreciable loss in weight, and frequent picking over is resorted to in an endeavour to minimise this loss.

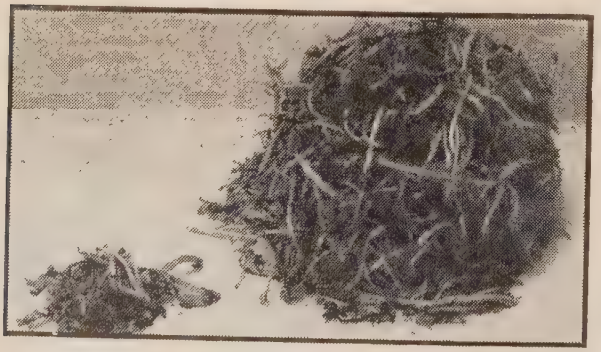
IN recent years the effect of various chemicals on potato sprouting has been investigated in America at the Boyce Thompson Institute for Plant Research. The attention of the writer was first drawn to this subject by a report appearing in the contributions of the institute for July, 1942 (1), which referred to the promising results obtained in the inhibition of sprouting by the use of a plant hormone—methyl ester of alpha-naphthaleneacetic acid. Different methods of application were employed, the simplest and most effective being the dusting of the tubers with methyl ester incorporated in talc powder to facilitate distribution of the active principle. By this method 1⅓ grammes of methyl ester incorporated in 3oz. of talc powder and used to treat 1cwt. of potatoes inhibited sprouting satisfactorily for seven months after harvest.

Similar results have since been reported by other American workers. In one instance (2) the suggestion was advanced that treatment should be undertaken just before the advent of warm weather. In another instance (3) the use of the methyl ester at twice the rate mentioned previously gave better control of sprouting. This report referred also to some internal injury of the tubers, with consequent darkening of the flesh, and suggested that this condition might be attributable to the application of the treatment after the potatoes had passed through their dormant period.

New Zealand Trials

A small quantity of methyl ester of alpha-naphthaleneacetic acid incorporated in talc powder was manufactured in New Zealand in 1944, and in August of that year a few tubers were dusted with the preparation just after sprouting had begun. Treated and untreated tubers were held in an outhouse at Lower Hutt until November, by which time the untreated tubers had sprouted badly and were very soft and shrivelled. The treated tubers were still firm and showed little sprouting, but on being cooked blackened more than did the untreated tubers. That seems to conform with the suggestion that treatment of tubers after they had passed the dormant period might result in injury.





Two lots of potatoes were taken from the same crop, and on August 6, 1947, one lot was given the hormone treatment. The upper illustration shows samples of the treated (left) and untreated potatoes, photographed on October 23. Above are the sprouts from 80lb. of the treated lot (left) and an equal quantity of untreated potatoes.

In 1945 a further quantity of tubers was treated at the end of July before sprouting had begun. Treated potatoes showed virtually no sprouting and were quite firm at the end of October, whereas similarly-stored untreated potatoes were shrivelled and had sprouts up to 4in. long. No darkening of the flesh was observed in treated tubers in this trial.

During 1947 several trials were undertaken by officers of the Fields Division to determine the efficiency of sprout-inhibiting dust preparations having as an active principle the methyl ester of alpha-naphthaleneacetic acid.

In one trial in the North Island 80lb. of potatoes were treated before sprouting began and stored alongside a similar quantity of untreated potatoes. On October 23 the treated potatoes weighed 76¼lb. after the removal of ¼lb. of sprouts, while the untreated potatoes weighed 69¾lb. after the removal of 5¼lb. of sprouts. In addition to the saving of 8 per cent. in the weight lost, the treated potatoes were still firm and attractive in appearance, in marked contrast to the shrivelled appearance of the untreated potatoes.

Trials in the South Island with five varieties also revealed that with application of dust at rates varying from 5 to 8oz. per hundredweight of potatoes sprouting was definitely retarded. Four lots were treated in different localities during June-July, 1947. By October and November the dusted potatoes were strikingly superior in appearance to the untreated potatoes, the following report made on November 24, 1947, being typical of those received from officers conducting the experiments:—

Untreated potatoes: 100 per cent. sprouted, with sprouts up to 6in. long; large numbers of fibrous roots; all tubers soft.

Treated potatoes: 100 per cent. sprouted, but all sprouts only about 1in. long; only a few fibrous roots; all tubers slightly soft.

Further comment on this trial was that the treatment appeared very effective up to say mid-October, until when there was no significant sprouting of the dusted potatoes.

The results of overseas investigations and the observations made in New Zealand indicate the efficacy of methyl ester of alpha-naphthaleneacetic acid for inhibiting the sprouting of potatoes and suggest the desirability of more extensive trials. In the meantime the following points present themselves:

Tubers can be maintained in much better condition by treatment with the hormone.

The method of application is very simple.

Treatment should be undertaken before sprouting begins.

Tubers intended for seed should not be treated.

Acknowledgment

Thanks are expressed to Mr. P. J. Clark, M.Sc., of the Dominion Laboratory of the Department of Scientific and Industrial Research, for his assistance in preparing the methyl ester used in the New Zealand observations.

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2. Thomas, J. E., and Riker, A. J., 1945: Sprouting of potatoes inhibited by plant hormones. "American Potato Journal," Volume 22 (4), pages 104—113.
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"Flowery, Green, Bird-singing Land"

[National Publicity Studios photo.

The green headland of Thule.

IT is only two hours' journey by steamer from the mainland to Stewart Island, but it might be two days or weeks away, so complete is the cleavage between the workaday world and the enchantment of the island which Captain Cook and succeeding navigators for nearly 40 years mistakenly considered a peninsula. An American sealer named Smith was the first man to discover the narrow stretch of water separating the South Island from the "Isle of Glowing Skies" and the accuracy of his chart is particularly commendable, as he had only a whaleboat in which to conduct his explorations. He derived neither fame nor fortune from his important discovery owing to the foolish regulations governing sealing operations at the time. Greater credit, however, was accorded the next hydrographer, William Stewart, first officer of the sealing brig Pegasus, the island being named in his honour. He surveyed the region five years after Smith's voyage, and vessels have sailed Foveaux Strait ever since.

These are the waters where dolphins play and sometimes you will glimpse whales spouting before they plunge beneath the racing waves. All the way across there is a host of little islands opal blue and green, but none can compare with the exquisite gem crowning the southernmost strait of New Zealand and which the Maoris refer to as Rakiura (heavenly glow), because at sunset it shimmers with the fiery colours of the skies. Even a stormy crossing is a small price to pay for the privilege of visiting this loveliest of islands, and high winds and heavy seas are soon forgotten when you enter the tranquil harbour within its halfmoon arc of hills.

The moment you set foot ashore you feel the urge to explore. There are a dozen different routes to choose from, for the island is honeycombed with tracks bearing clearly-marked signboards, so that you can wander through the bush for miles without fear of being lost. You may prefer to follow the coastline, where the gorse blooms in golden splendour, the fruits of the astelias gleam like beryls, and the sands are strewn with coral-coloured seaweeds and long necklaces of amber kelp. A short distance out in the bay is "the little island," on which the seabirds nest, and further on toward the point is "the nugget," the huge rock that is the scene of Edith Howe's delightful story for children, "The Singing Fish."

Should you choose to set off in the opposite direction you can climb up past the red-roofed church with its slender steeple and follow the white road leading over the hill and down to a wide brown creek which flows slowly out to sea. Below the bridge slabs of timber from an old sawmill make a pattern like piano keys on the silver sands, and on the far bank the thickly-crowding trees are wreathed in snowy drifts of bush lawyer blossoms. It is pleasant to linger there, where the pipiwhararoa (the shining cuckoo) sings, and watch the dark shadow of wind on the water, and the puheretaiko leaves, which the mutton-birds use to line their nests, blowing with their broad white backs uppermost, so that from across the gully the entire grove appears to be covered with snowflakes.

The hill road leads to Butterfield's Beach. On the way you will see the smoke-blackened cave in which an old man lived for 15 years. He even fenced off a little plot of ground and grew flowers there till he died at the age of 85. If you continue over the hills—and the roads wind through mile upon mile of magnificent bush—you will arrive at Horseshoe Bay, where shells mark the tide ripples on a mile-long curve of shore, daffodils dot the wayside grasses, and a farmer forsakes his flocks for a few hours to help repair a fishing launch.

A much shorter walk and one favoured by visitors and residents alike is the ascent of the central hill behind the township at Halfmoon Bay, past the "house without nails," whose Norwegian timbers have been ingeniously dovetailed together and whose eaves are ornamented with red-tongued gargoyles, and thence up the slope to Observation Rock, where you can gaze on one of the most beautiful views in the world—the jade-green waters of Paterson Inlet with Iona's wooded isle in the foreground and the bird sanctuary of Ulva beyond and Rakiura's misty blue coastline extending from the entrance to the inlet right down to Rakeahua Mountain. The 3000ft. peak of Hakanui, the extinct volcano now known as Mt. Anglem and home of mountain buttercups and celmisias, whipcord veronicas, and a rare, moss-like raoulia, is plainly visible above the rising waves of foothills. The bay immediately below Observation Rock is appropriately named Golden because of its glistening sands and on its right stretches the green headland of Thule, with the eternal trinity, the islands Faith, Hope, and Charity, lying like emeralds on the water's bosom. The march of the forest is halted only by the shoreline, the hillsides being covered with bronze-leaved kamahi and purple-flowered kotukutuku, rimu, rata, and towering totara, silvery-barked beech and graceful pine, needle-foliaged miro, and lacy-fronded mamaku. How Corot would have loved to paint that galaxy of greens.

Half-way down the hill you will see a gate made of mamaku, the big black tree fern which dominates the island. (The residents use the fern trunks for all purposes—fence posts, foundation piles, toolsheds, terraces, weatherboards, and windbreaks.) The owner of this estate has not only buttressed the steps and paths with fern boughs, but has used them to enclose her currant bushes and to make a decorative compartment for compost. Her mamaku summerhouse with its thatched roof and inner walls lined with tapa cloth is a perfect blending of Polynesian artistry.

You descend by way of ferny tracks where the ground is carpeted by spider orchids, and the last blossoms linger on the kowhais like great golden moths, and clematis stars the cloud-dark branches of the trees overhead. The road down to Thule skirts a series of cliffs. Patches of grey lichen flecked with pink pinhead flowers form a mosaic on a protruding rock face; ferns spill over the edge of another, and a whole waterfall of lycopodium cascades down the steepest bluff of all. The hinahina, the grass tree, with its fragrant, heath-like flowers flourishes here, and if you search the banks of the promontory you will find all sorts of small growths—ruby-berried nertera and waxy-belled nohi; the black orchid, clavaria, and the sweet-scented earina, which blooms in winter; earthstar fungus and soft, feathery sphagnum moss.

High on the hillslope there is a seat hidden among the trees. It can be reached only by steep steps down which a stream seeps in diamond drops. The track turns and twists upward through the undergrowth, bringing you at length to a leafy ledge where you can listen to the tui's chime of five silver notes and look your fill upon the limpid waters caressing Thule's curving shores. It is a place to return to time and again, in the early morning and at the rosy hour of sunset, on blue days of brilliance and quiet days of rain, if you would come close to the heart of this "flowery, green, bird-singing land."

Mary

Potatoes Need not be the Dull Part of a Meal

POTATOES are a food which everyone should be trying to put to its fullest use at present, for by doing so more of other foods are released to be sent to Britain. But there is a marked seasonal variation in the quantity of potatoes available, and to know how to take advantage of periods when they are abundant and relatively cheap is one mark of a housewife's ability to manage her budget well. The uses described in this article by Eirene Unwin, Rural Sociologist, Dunedin, enable this ideal to be approached and yet monotony to be avoided.

TO make the best of any food it is necessary to know its nutritive value and how to cook it to preserve the maximum of that value. As well as starch, which gives energy, ½lb. of potatoes peeled and uncooked supplies about one-tenth of the daily iron requirement, one-fifth of the vitamin B, and not quite half of the vitamin C. When potatoes are cooked, even by the most conservative methods, these quantities will be slightly reduced, as all these substances are soluble and some of each will dissolve out into the cooking water if potatoes are boiled and will be lost if the cooking water is thrown away.

Decreasing Loss of Vitamins

There are several methods of decreasing this loss:—

1. Boil the potatoes whole in their skins. They may be served in their skins or peeled before being served. The latter takes time during the already-busy dishing-up period, so it is an advantage if the family does not object to eating the skins. If the potatoes are smooth and not too old, the skins are not unpleasant and can even be left on mashed potatoes. Some people do not like the pieces of skin mixed in the mashed potatoes, but others do not object, and to avoid peeling the potatoes at all saves both food value and time.

2. If the potatoes are peeled before being cooked, loss by solution can be reduced by putting them into boiling salted water and bringing them back to the boil as quickly as possible. That is facilitated by using the minimum of water and by keeping the lid on. The water should be kept boiling until the potatoes are cooked. It is well to use the cooking water in soups or gravy, thus utilising the vitamins and minerals dissolved in it, and the smaller the quantity the easier it is to use up; also, many of the potatoes will be cooked in the steam and not in the water, and loss by solution from these upper potatoes will be practically nil.

3. The third method is not to cook the potatoes in water at all. Steaming is an excellent method, as there is then no loss by solution. Other "dry" methods are frying, roasting, and baking, and all are quite good, but with these only about four-fifths of the vitamin C is retained, for this vitamin is not only lost by solution but can be destroyed during cooking.

Speed of Cooking

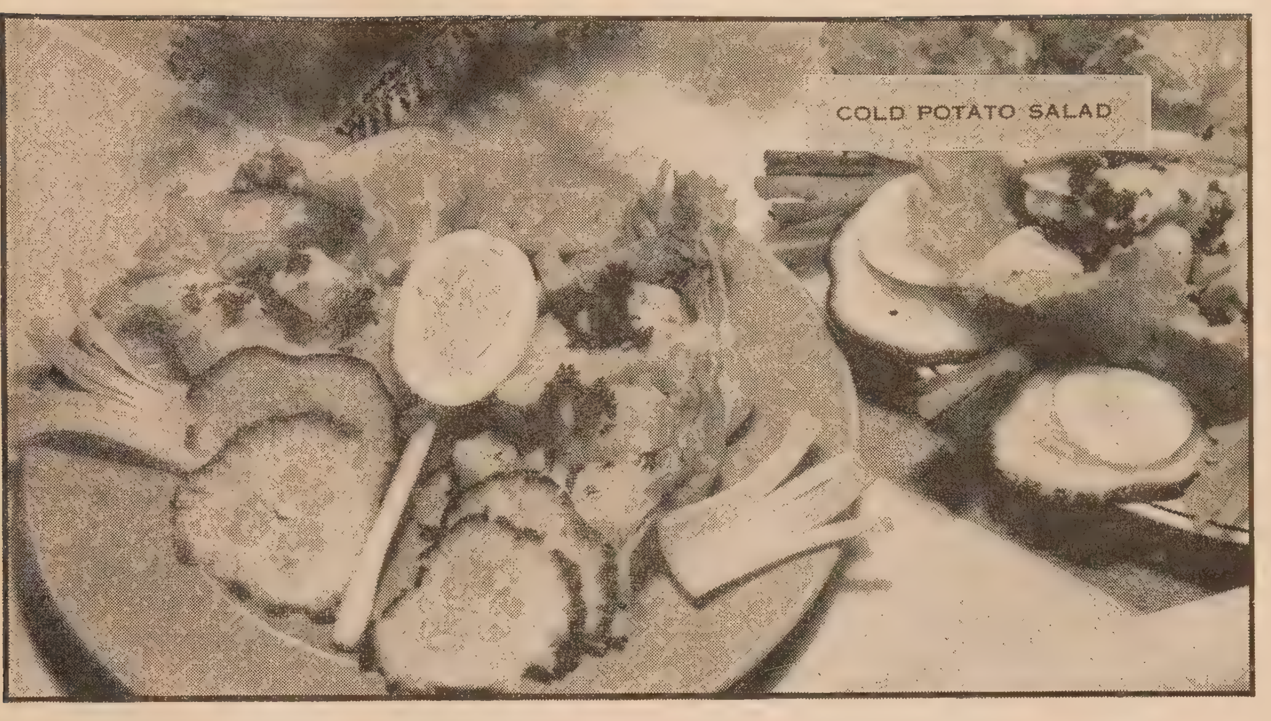
That the destruction of vitamin C is increased very much by heat, and the longer the heating time the greater the destruction, is the second important factor to remember when cooking and serving the potatoes—and, indeed, any vegetable which may be a good source of vitamin C if properly cooked. As potatoes are not the most important source of vitamin C in the diet (fresh fruits and vegetables are a good deal more valuable in this respect), it is not necessary always to consider this point, and in fact any already-cooked potato that is reheated for serving will probably have very little vitamin C left in it.

Nevertheless, potatoes should always be cooked as quickly as possible. If they are to be baked, put them into a hot oven (400 degrees F.) and keep it at that temperature. If they are to be steamed, do not put the potatoes into the steamer until the water beneath is boiling, put the lid back on the steamer at once, and keep it on. If they are to be fried, put them into smoking hot fat in sufficiently small quantities to prevent the fat from cooling right down.

In every case the potatoes should be served as soon as they are cooked. If they have to be kept before being eaten, it is better to cool them quickly and heat them again just before serving them, rather than keep them hot a long time.

POTATOES WITH BACON (BELGIAN MANNER)

[*Sparrow Industrial Pictures Ltd. photo.*



[*Sparrow Industrial Pictures Ltd. photo.*

Here is a variety of ways of serving potatoes, both fresh and "left-over":—

Fresh Potato Recipes

Baked Stuffed Potatoes

Choose smooth, even-shaped, fairly-large potatoes. Scrub and bake them on an oven tray until they are soft when pressed with the fingers or when pierced with a sharp-pronged cooking fork or fine skewer. Cut off the tops or cut them in halves across. Scoop out the insides, leaving about ¼in. of flesh on the skin. Mix the scooped-out flesh with dripping (1 teaspoon to 1 cup of cooked potato), seasoning, flavouring, and hot milk to bind. Fill the potato shells with the mixture, decorating the top with a fork. If necessary cut a little slice off the bottoms of the potatoes so that they will stand. Replace them in a hot oven, heat them through, and brown the tops. Garnish with parsley.

Suggested savoury flavourings are: Grated cheese (¼ cup to 1 cup of cooked potato); cooked, finely-chopped bacon or ham; finely-chopped celery, chives, parsley, and cooked onion; tomato sauce and herbs; left-over cooked fish, which must be well seasoned; or cooked sausage meat.

Baked Sausage and Potato

Scrub large potatoes. Make a hole in each with an apple corer, and fill the holes with sausage meat. Bake them until the potato is cooked and serve them hot.

Mashed Potatoes

When potatoes are cooked and strained they should be mashed hot, and hot milk, melted dripping or butter, and seasoning added and beaten in. Add 1/3 to ½ cup of hot milk and up to 1 tablespoon of fat to each 6 potatoes. Here are three mashed potato variations:—

Duchess potatoes.—To 2 cups of mashed potato add 1½ beaten egg yolks, beat the mixture thoroughly, and shape it into mounds on a greased baking dish. Brush the mounds with the remaining ½ egg yolk, and place them under the grill or in a very hot oven (450 degrees F.), and brown them lightly. The mixture may be forced through a pastry bag to make rosettes or other fancy shapes for party occasions. (Six small portions.)

Savoury mashed potatoes.—To 2 cups of mashed potato add one of the following:—

1 tablespoon of minced watercress, 1 teaspoon of minced mint leaves, and a dash of white pepper;
2 to 3 tablespoons of finely-chopped parsley;
1 to 2 teaspoons of finely-chopped chives;
½ teaspoon of mixed herbs;
½ to ¾ cup of grated cheese.

Potato souffle.—To 4 cups of moist mashed potato add 2 well-beaten egg yolks, seasoning, and flavouring (any of those suggested for savoury mashed potato are suitable, especially cheese), and last fold in the 2 stiffly-beaten egg whites. Turn the mixture into a greased casserole and bake it in a moderate oven for ½ to ¾ hour at 300 degrees F. (slow oven) or until lightly browned. Serve at once in the dish in which it was cooked. (Six portions.)

Potatoes with Bacon (Belgian manner)

Partially cook six slices of bacon. Remove them from the pan while slicing in thinly 1 large onion and 6 potatoes. Add pepper, 1½ teaspoons of salt, 2 teaspoons of herbs, and 2 cups of water, and cook until it is tender. (Four portions.)

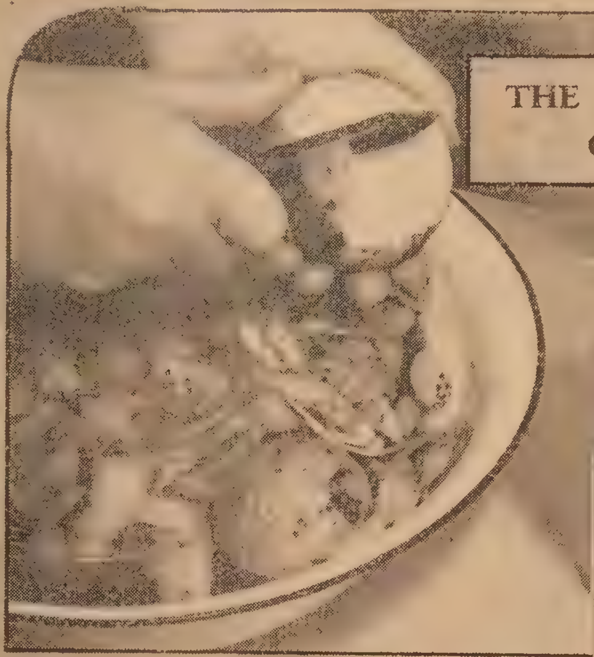
Potato Boats

Peel 6 medium-sized, oval potatoes, cut a slice off one side of each, and hollow out the centres. Cook them in boiling salted water for 10 minutes. Drain, dry, and fry them in deep fat at 385 degrees F. (a bread cube browns in 40 seconds at this temperature). Drain them on soft paper and fill them with left-over meat, fish, or vegetables, seasoned and mixed with a medium white sauce (made according to the recipe for thin white sauce at the end of this article, but using twice the quantities of flour and fat). Serve hot.

Scalloped Potatoes

Peel and slice 6 medium-sized potatoes. Place half in a greased baking dish, sprinkle them with salt and pepper, and dredge them with flour. Repeat with the other half. Add 2 teaspoons of butter to 2 cups of hot milk and pour it over the potatoes. Bake them covered in a moderate oven (375 degrees F.) for 30 minutes, then uncover them and bake them for 10 to 15 minutes longer or until they are browned. (If the milk boils over, uncover the potatoes

THE OLD AND THE NEW METHODS OF PREPARING POTATOES



Top left and above—The old way: The potatoes are peeled and put in a saucepan, hot water is poured over them, and they are boiled.

Above and right—The new way: The potatoes are scrubbed and cooked in a steamer over boiling water.

and bake them at 350 degrees.) A tablespoon of chopped onion may be added to the milk for flavour. (Six portions.)

For variations of this recipe either sprinkle ½ cup of chopped cooked ham over each layer of potato, or sprinkle it with grated cheese and breadcrumbs before the final 10 minutes of cooking.

Potatoes with Cheese

Boil 12 potatoes, then drain, dry, and peel them. Divide each lengthwise, brush them over with 2oz. of melted butter or dripping, and sprinkle them with 2oz. of grated cheese. Bake them until they are brown.

Recipes Using Hot Cooked Potatoes

Hot Potato Salad

Boil and peel 1¼lb. of potatoes, or peel them raw and steam them. Dice them while they are hot and mix them with ½ cup of sliced celery, 2oz. of onion, and chopped parsley. Fry 2oz. of finely-cut bacon. Add the fat in which it has been cooked to 1 tablespoon of vinegar, 1 dessertspoon of water, salt, and pepper, and pour it over the potato mixture. Stand it in a warm oven for 30 to 40 minutes to season. Serve hot.

Cold Potato Salad

Mix 3 cups of diced hot potatoes with about ½ cup of salad dressing and cool it thoroughly. Add 2 hot chopped, hard-boiled eggs, chopped celery, cucumber, and onion to taste, chopped parsley, salt, and pepper. Serve in lettuce cups.

Eggs, celery, and onion may be omitted, or other cooked, diced vegetables added in small amounts. The potatoes mixed with the dressing while hot, and then allowed to cool, are delicious served with cold meat and salad instead of freshly-cooked hot potatoes.

Left-over Potato, Mashed Dry

Potato Cheese Appetisers

Cream ¼ cup of butter or dripping and add 1 cup of grated cheese, ½ teaspoon of made mustard, ¼ cup of flour, ½ cup of dry mashed potato, 2 or 3 drops of Worcester sauce, and seasoning. Form the mixture into small balls. Bake them in a hot oven for 5 minutes and serve them hot or cold.

Potato Dumplings

Mix ½ cup of dry mashed potato, ½ cup of flour, 2 teaspoons of baking powder, and salt to a scone consistency with milk. Drop spoonfuls in on top of a boiling stew, put the lid on, and cook it for 10 to 20 minutes without removing the lid. Serve hot, with the stew.

Potato Pastry

First recipe: Mix 1 cup of dry mashed potato, 1/3 cup of flour, 1 to 2 tablespoons of melted fat, and seasoning together with milk. Roll it out on a floured board as for ordinary pastry. Use it for sausage rolls, Cornish pasties, etc. If used for a meat pie, increase the flour slightly.

Second recipe: Rub 5oz. of fat into ½lb. of flour until the mixture is like fine breadcrumbs. Lightly mix in 4oz. of dry mashed or sieved potato, a pinch of salt, and 1 teaspoon of baking powder. Mix it to a dry dough with as little cold water as possible. Roll it out on a floured board to about ¼in. thick, and bake it in a hot oven. Use it for savoury dishes, or for sweet dishes if the potato flavour is not too marked.

Vegetable flan using potato pastry.—Line a flat tin with potato pastry and bake it in a moderate oven. Then fill it with diced cooked carrots and celery, sprinkle them with grated cheese, and brown the flan under the grill or in the oven.

Potato Scones

Rub 2 tablespoons of dripping or soft fat into 1 cup of flour and mix with it 1½ cups of dry mashed potato, 2 eggs, 2 tablespoons of milk, 1 teaspoon of baking powder, and salt. Roll it out about ½in. thick, cut it into squares or rounds, and fry them in a small quantity of fat or bake them with very little fat in a hot oven. Serve hot.

Cold Left-over Potato

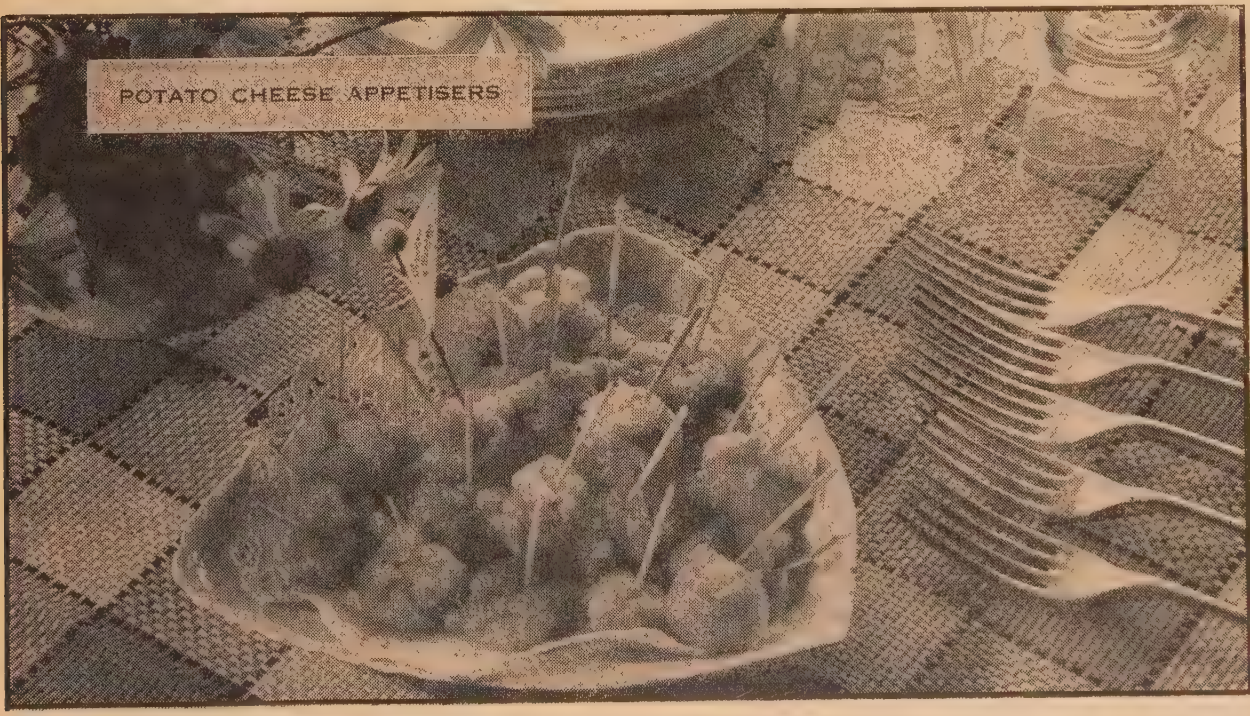
Savoury Apple Fritters

Grate 2oz. of cheese and 1 apple, and mix them with 1 cup of mashed potato, a beaten egg, salt, and pepper. Roll the mixture in crumbs or dip it in batter, and fry it in hot fat.

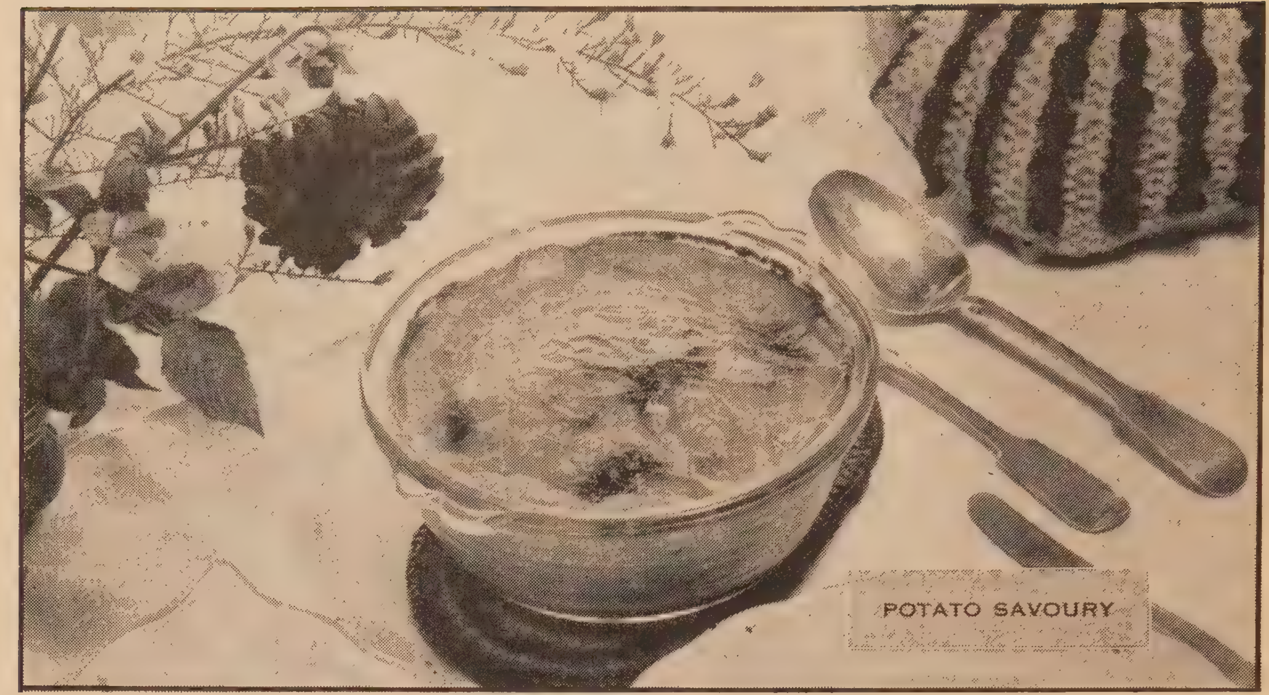
Vegetable Puffs

Make a stiff paste with a cup of cold cooked vegetables and potato sieved or mashed. Add 1 teaspoon of baking powder, 2 tablespoons of flour, salt, and pepper. Roll the paste out, cut it into rounds or fingers, and fry them in deep fat.

Photographs on this page and opposite page by Sparrow Industrial Pictures Ltd.



POTATO RECIPES



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Potato Toast

Mix cold mashed potato with a little milk and seasoning and form it into fairly-large flat cakes. Fry them on both sides until they are well browned. Use them in place of toast under or with egg, mince, creamed fish, or bacon.

Potato Loaf

Mix 2 cups of mashed potatoes with 4 teaspoons of minced onion, 2 tablespoons of chopped celery, ½ cup of tomato pulp, 1 egg, salt and pepper, and 1/3 cup of chopped roasted peanuts (optional). Put the mixture in a greased baking dish and bake it at 350 degrees for 25 minutes. Turn it out and serve it with gravy or tomato sauce. (Six portions).

Potato Puffs

Melt ½oz. of fat, add 1lb. of mashed potatoes, and heat them. Add salt, pepper, 1 egg yolk or whole egg, and sufficient flour to make a mixture which will roll out. Roll it to ¼in. thick and cut it into oblongs. Place on half some well-seasoned cold minced meat with savoury sauce added, fold the pastry over, pinch the edge, and fry it in a shallow pan or bake it for 15 to 20 minutes in the oven.

Fish and Cheese Pie

Boil 10 medium-sized potatoes and steam 1lb. of fish over them. When the potatoes are cooked peel them and slice them thickly. Remove the fish bones and skin. Grate 4 tablespoons of cheese. Grease a piedish or casserole and put in thick layers of potatoes (with a little fat), then fish, cheese, and milk, seasoned with mustard, pepper, and salt. Bake the pie in a moderate oven until it is hot through and brown on top. Left-over mashed potato may be used instead of fresh potatoes, and also left-over cooked fish.

Potato and Peanut Butter Hash

Heat ½ cup of peanut butter in 1½ cups of water in a frying pan. Add 1 onion, finely chopped, and cook it until it is tender. Add 1 teaspoon of salt, ⅛ teaspoon of pepper, ½ cup of milk, and 2 cups of cooked diced potatoes. Heat the mixture slowly until it is boiling, then simmer it until the potato absorbs the liquid. Serve garnished with parsley. (Six portions).

Treasure Trove

Make 1 tablespoon of flour, 1 tablespoon of butter, ¾ cup of milk, ½ teaspoon of salt, and pepper into a white sauce by the method given at the end of this article. Then add to it 1 cup of cooked diced potatoes, 1 hard-boiled, finely-chopped egg, and ¼ cup of roasted chopped peanuts or 1 tablespoon of peanut butter. Serve hot, garnished with parsley. (Six portions).

Oakhill Potatoes

Cook 2lb. of potatoes, then cool and slice them, or slice left-over cold potatoes. Put layers of potatoes in a greased casserole, sprinkling each with a layer of sliced egg; season each layer. About halfway through put in 2 or 3oz. of lightly-cooked bacon. Pour two cups of thin white sauce over. Cover the mixture with ½ cup of buttered crumbs mixed with 1½ to 2oz. of grated cheese, and bake it until it is golden brown — ¾ to 1 hour at 350 degrees.

Potato Savoury

Slice 4oz. of onions and fry them in shallow fat. Steam 1¼lb. of potatoes and slice them into a dish alternately with the onion. Make 1½oz. of fat, 1oz. of flour, and 2 1/6 cups of milk into a thin white sauce. Add 1½ cups of tomato puree slowly, stirring well, then stir in 4oz. of grated cheese. Pour the mixture over the potatoes and onions and bake it for 45 minutes in a cool to moderate oven.

Thin White Sauce (1 cup)

Melt 1 tablespoon of fat in a small saucepan, stir in 1 tablespoon of flour, and cook stirring over a low heat for 2 to 3 minutes. Then add a little at a time 1 cup of milk, stirring all the time; bring the sauce to the boil and stir until it is smooth after each addition. Half milk and half vegetable water may be used for a savoury sauce.

Buttered Crumbs

Use fresh breadcrumbs—that is crumbed day-old or stale bread, not dried crumbs. Melt about 1 tablespoon of butter, tasty dripping, or bacon fat for each cup of crumbs and stir it into the crumbs in a small bowl until they are thoroughly blended. Use for sprinkling over savoury dishes.

Many of the recipes given may be varied according to taste and the cook's discretion. Different or extra seasonings or flavourings may be added, and expensive or scarce ingredients may sometimes be omitted, but the recipes are sufficiently varied to indicate the wide number of uses to which potatoes may be put.

The Role of Lime in the Flower Garden

HOME gardeners are often puzzled to know whether to apply lime to flower borders. The effects of liming on flowers are discussed in this article by J. P. Hudson, Horticulturist, Wellington.

IN the concluding article in the series about the rules of good flower gardening, in last month's "Journal," organic matter, fertilisers, and lime were mentioned as the three types of material which are commonly added to the soil to improve its fertility. Plants grow best in soils well supplied with humus, and the importance of regular applications of organic matter was stressed. The question of using fertilisers on the flower garden was also discussed as fully as possible in view of the limited knowledge of the needs of flowers for the chemical elements of fertilisers. Lime, however, was left to be dealt with in a separate article, as the question of liming flower borders is complicated.

Lime plays a most important part in soil management and can confer great benefits if used correctly on soils that need it, but may easily do far more harm than good if applied to ground that does not require liming or to plants that will not tolerate lime.

Therefore, before deciding whether to lime a flower border it is worth while to consider what lime is, what it does, and which flowers may require it.

Origins of Lime Deposits

One of the chemicals of which the earth is composed is an element called calcium, which occurs in a number of the different minerals of which the rocks of the earth's crust are made up. Calcium differs from many of the other constituents of rock in one very important respect.

Many of the minerals of which rocks are composed are practically insoluble in water and become freed as grains of sand, silt, or clay as the rocks gradually weather and crumble away. These particles are washed downhill, and from their gradual accumulation in the course of time the alluvial soil in valley bottoms and coastal plains is built up and great stretches of mud deposited off shore.

Unlike these more or less insoluble parts of the rocks, calcium salts tend to be dissolved in any water that percolates through the soil, and ultimately find their way through the streams and rivers to the sea. Sea water contains vast amounts of calcium salts that have accumulated there since first the rivers began to run—hence its saltiness—but fortunately that is not the whole story.

A variety of sea creatures, from the largest shell fish to floating creatures of microscopic size, take calcium out of the water and change it into calcium carbonate, out of which they build up the massive shells or delicate fairy-like skeletons which support their flesh or protect them from their enemies. As myriads of these creatures die and sink to the bottom, great masses of their skeletons gradually accumulate on the floor of the ocean, where the weight of water crushes and compacts them into a layer of calcium carbonate rock which, according to its subsequent history, may become limestone, chalk, or marble, all composed of calcium carbonate. The gradual upheaval of the bed of the ocean often brings these deposits above the level of the sea, where they may become such familiar sights as the limestone hills of Otago or the white chalk cliffs of southern England.

Through this majestic cycle of nature the calcium scattered through the original rocks is accumulated into great deposits, and these various forms of calcium carbonate now provide the world with lime.

Forms of Lime

Early in the history of agriculture it was found that many crops grew better if the soil was first dressed with chalk, spread just as it was dug from nearby pits, but lime is now available in various forms which are much more convenient to use.

Ground limestone (available in 40 to 50lb. bags as "garden lime") is limestone rock quarried and crushed. It is the cheapest and most convenient form in which to buy lime for the garden, though the samples are not always pure calcium carbonate but may contain rather a high proportion of other minerals that reduce its value. Garden lime should be ground finely, as the speed with which it acts in the soil depends on its fineness of grinding.

[*Photo News Ltd. photo.*

Primroses or polyanthus, dug carefully from the garden, look charming planted in a bowl and taken into the house, where they will flower for weeks.

Burnt lime (quick lime, lump lime, or roche lime) differs chemically from limestone, from which it is made by heating lumps of quarried limestone in a specially-designed kiln. The heat drives off carbon dioxide gas, leaving lumps of calcium oxide. This takes up water very readily, is caustic, and is hard to store for any length of time. It is best kept in sealed tins but is not a very desirable material to have about the home.

Hydrated lime (slaked lime) is made by adding water to burnt lime, which absorbs it readily, heating up in the process and finally breaking down into a fine white powder if care is taken not to add too much water. The product is a combination of calcium oxide and water (calcium hydroxide), rather more quickly active in the soil than ground limestone and useful for making up whitewash and Bordeaux mixture. Though not as caustic as burnt lime, hydrated lime is usually sold for home use in sealed tins and should be kept in them. If exposed to the air for any length of time, hydrated lime takes up carbon dioxide from the atmosphere and changes back into calcium carbonate, when it becomes useless as an ingredient of Bordeaux mixture. Because of this reversion to carbonate of lime hydrated lime was used in mortar before the advent of cement.

The effectiveness of each form of lime depends partly on its state of fineness, hydrated lime being the finest and quickest acting, and also on the proportion of calcium in its make-up. Burnt lime contains twice as much calcium as ground pure limestone and half as much again as hydrated lime. Therefore, where a dressing of say 2oz. a square yard of ground limestone is recommended, 1oz.

of burnt lime or 1½oz. of hydrated lime would provide the same amount of calcium.

Functions of Lime

It has already been explained that calcium is continually being taken into solution by moisture passing through the soil and being carried away into the drainage water. In dry districts, like Otago Central, there is probably little loss of calcium from this cause, but elsewhere the soil's stock of the chemical gradually becomes depleted, and the wetter the district the more rapidly calcium is lost. Loss of calcium, which is a base (alkaline), results in the soil gradually becoming more acid. Apart from rainfall, many other factors, including the nature of the soil and subsoil and the type of vegetation, also affect the soil "reaction"—that is, whether it is acid, neutral, or alkaline.

Lime is important because it is the only available material which can be bought in sufficient quantity and at a low enough price for farmers or gardeners to use it to correct acidity in the soil, but that is not the only purpose of adding lime to the soil. Apart from affecting the soil reaction, lime has a profound effect on the texture of most soils. It makes sandy soils less likely to dry out and clay soils less heavy and sticky by improving the tilth and "structure" of both. The improved texture also assists the proper aeration of the soils and helps surplus water to drain through them. Lime encourages the activity of worms and useful bacteria in the soil, helps to make certain plant foods available, and, finally, is in itself an important plant food, though in New Zealand plants rarely suffer from lack of sufficient calcium.

In fact, lime has so many virtues that it would seem at first wise to apply it to all flower borders, if only as an insurance, but that is by no means the case. Some of the most beautiful flowers and shrubs will strongly resent the use of lime, which may make their leaves go yellow or even kill them outright if the lime materially alters the reaction of the soil. The preferences of plants must be considered before liming flower borders.

Preferences of Plants

A great deal of work has been done, especially in America, on the preferences of plants for soils of various reactions. A long list of plant preferences has been published by the Michigan State College in Special Bulletin No. 306, "Soil Reaction (pH) Preference of Plants," by C. H. Spurway. The following list of plants of interest to New Zealand gardeners has been culled from that bulletin:—

A: Prefer Strongly-acid Soils

Azalea
Camellia
Heaths
Kalmia latifolia
Rhododendron

B: Prefer Medium-acid Soils

Andromeda
Coreopsis
Hydrangea (blue)
Magnolia
Narcissus (most varieties)
Solomon's seal

C: Prefer Medium-acid to Neutral Soils

Almond
Belladonna
Aster
Begonia
Chrysanthemum
Cineraria
Cornflower
Cyclamen
Forsythia
Fuchsia
Gazania
Gladiolus
Leopard's bane
Pansy
Pentstemon
Phlox Drummondii
Polyanthus
Pot marigold (calendula)
Primrose
Rose (hybrid tea)
Rudbeckia
Schizanthus
Tulip
Weigela

D: Will Succeed in Soils Ranging from Medium Acid to Medium Alkaline

Abelia
African marigold
Alyssum
Anemone, Japanese
Antirrhinum
Ash, mountain
Aubretia
Balsam
Buddleia davidii
Canna
Canterbury bell
Carnation
Dahlia
Delphinium
Freesia
French marigold
Gaillardia
Genista
Geranium
Godetia
Hellebore
Hollyhock
Hyacinth
Hydrangea (pink)
Iceplant
Jasmine
Kalanchoe
Larkspur
Lavender
Lilac
Lobelia
Love-in-a-mist
Lupin
Marguerite
Mock orange
Monkshood
Oleander
Peony
Petunia
Phlox, perennial
Pink
Poppy, Iceland
Poppy, oriental
Pyrethrum
Scabious
Soapwort
Spiderwort
Stock
Sunflower
Sweet pea
Sweet William
Thalictrum
Verbena
Violet
Wallflower
Walnut
Wistaria
Zinnia

E: Prefer Strongly-alkaline Soils

No flowering plants of importance in New Zealand gardens.

The soil conditions referred to in the lists are those in which the plants can come to ideal growth. Many of the species will survive under other soil conditions but will not really thrive.

Many of New Zealand's most popular flowering plants are extremely tolerant of a wide range of soil reactions. In fact, it is quite likely that this is one of the main reasons why these species have become so popular, as few soils are unsuitable for their growth.

[The term "pH" referred to in the title of the American bulletin is often used in connection with soils, as it provides a convenient term for referring to degrees of soil reactions. A clear account of the term and its use is given by E. B. Davies in "The Lime Requirement of Soils," Bulletin 240, obtainable free from any office of the Department of Agriculture.]

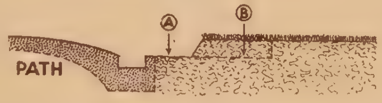
Use in the Flower Border

On the question of how and when to use lime in the flower border, it can be said at once that lime should very rarely, if ever, be applied under New Zealand conditions to soil in which plants in groups A and B are growing.

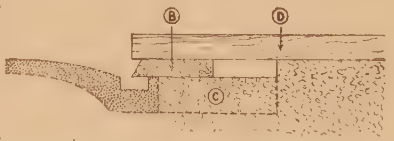
In most soils it would be safe to dress with lime borders in which flowers in groups C or D are growing, and in most soils this could be expected to improve the texture and bring about improved rooting and growth. However, when liming borders it should be remembered that lime is carried down through the soil in the subterranean drainage water, and lime should not be used on sloping ground if plants in groups A and B are growing further down the slope.

Ideally, the soil in each border should be tested for texture and for pH, after which the quantity of lime

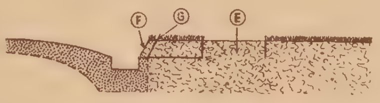
REPAIRING A LAWN EDGE



LAWN edges become ragged as alternate wetting and drying cause the soil to crumble, or people step on the edge and break away pieces of turf. To rectify this the edge should be carefully trimmed back to a new line at least once a year, preferably in spring. But this annual trimming results in the edge of the lawn gradually receding, until eventually the bed which the grass surrounds has become too wide or the lawn has "crept" inches away from the edge of a path, leaving a strip of soil (A) which looks untidy and soon becomes overgrown with weeds. When this happens the lawn edge should be built out again to its original line.



First lift a row of turves (B) from the edge of the lawn, put them to one side, add fertiliser to the soil (C), work it up with a fork, and tread it firm. Next relay the strip of turf overlapping the line of the new edge by a few inches, fixing the level of the turf with a straight edge (D). Fill in the space between lawn and turf strip with soil (E), tread it firm, and sow it with grass seed. Cut back the edge of the lawn to a line about 2in. outside the desired position of the new edge (F) and leave it for a few weeks, keeping all traffic off it if possible. When the turf has knitted together the lawn can finally be cut back to the permanent edge (G).



required could be worked out precisely. Tests of that sort can be made under certain circumstances for farmers and commercial gardeners, but at present facilities are not available for carrying out soil tests for home gardeners. Until such facilities are available it is suggested that liming the flower borders be based on the following data:—

Two ounces a square yard can be taken as an average dressing of lime in the form of ground limestone (garden lime). Proportionately less would be required of the other forms of lime to add the same amount of calcium, as already explained.

This dressing could safely be used yearly (with the proviso given about plants in groups A and B) on an average loam soil, but should be halved on sandy soils, and it could be increased with advantage to 3oz. a square yard on heavy, sticky clays. If the soil is silt (that is, it feels silky to the touch when moist, without being gritty or sticky), lime may have few beneficial effects and should be used with caution on the flower border. The dressing could be increased slightly in very wet districts such as the West Coast, and it might be reduced by about half with advantage in districts of relatively-low rainfall such as the Canterbury Plains and parts of Hawke's Bay and Marlborough.

For the wise gardeners who make and use compost extensively and so maintain the humus content and fertility of their soil, by far the best way of using lime is to sprinkle it on the layers of material as the compost heap is made up and let it find its way to the soil through the dressings of compost.

WORK IN THE FLOWER GARDEN

[Photo News Ltd. photo.

The flowers of most hydrangeas except the white varieties can be "blued" by treating the soil in winter as described on this page.

Garden Work for June

Bedding plants for spring flowering can be planted up to the end of June in mild districts if the soil is not too sodden for planting. Elsewhere they should have been put out in autumn before the ground became too cold or wet. Double daisies, primroses, polyanthus, violas, forget-me-nots, wallflowers, gaillardias, and sweet Williams are all useful and worth a place in every garden. The last four should all be raised each year from seed sown in summer, and violas are best grown from cuttings taken in late summer. To increase double daisies and polyanthus the last year's plants should be dug up, pulled apart, and each piece ("crown") with leaves and roots planted separately, with the junction of roots and leaves slightly below the surface.

Chrysanthemums of the late, large-flowered varieties grown in pots for exhibition need a very long growing season. When the flowers finally fade the stems should be cut down nearly to the ground, any long suckers which may be growing cut back to the soil level, and the pots stood in a light, airy place to await the growth of new suckers from below the ground. These make the best cuttings, and should be removed for rooting as they appear.

Fuchsias make good pot plants for the house. They are best raised afresh each year from cuttings, but if it is decided to keep this year's pot fuchsias to flower again next year, they should be dried off gradually until the leaves drop and then stood in a cool, frost-free place for their annual rest before being repotted and started into growth again in late winter.

Hydrangea flowers are most unusual in that their colour depends more on the nature of the soil than on the character of the variety. Thus a variety that bears bright blue flowers in one garden may have pink ones in another, and even flowers of a metallic green in a third place. Varieties with naturally white flowers will not take on any other colour whatever treatment they may be given, but the colour of other varieties can be changed more or less at will by suitable soil management. For pink colours the soil should be dressed with lime each winter at the rate of 4oz. to the square yard, or heavier dressings if experience in any particular soil shows that this is not sufficient. Blue colours can be obtained by dressing the soil in winter with alum or aluminium sulphate, scattered for a few feet around each bush at the rate of up to 1lb. or even more a square yard. Only experience can show how much aluminium sulphate may be needed for satisfactory "blueing" in any particular soil, but if it is found after winter dressing that the flowers are not truly blue, a further dose of aluminium sulphate dissolved in water can be applied in early summer. Though much cheaper than the aluminium salts, sulphate of iron does not usually produce such satisfactory blue colours, but is more likely to make the flowers a curious metallic green.

Lawns can be kept healthy only by feeding them regularly. The best dressing consists of three parts of sulphate of ammonia, two parts of superphosphate (one part only on established lawns), and one part of sulphate of iron applied evenly at the rate of 1oz. a square yard. This should be applied four times a year, one of the dressings being due in June unless the ground is very wet, or the district is a very cold inland one, in which case it is probably safest to omit the mid-winter dressing.

Planting of new shrubs and trees can be continued if the ground is not too wet, especially if the soil is light and sandy, but it is folly to plant if the soil is too wet—that is, if it sticks to the boots when trodden on. If plants come to hand from the nursery

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* See "Tests with Timber Preservatives in New Zealand." By J. M. Kelsey—The N.Z. Journal of Science and Technology, Vol. 27, May, 1946, P. 446. Write to Boracure for reprint.

Once again science justifies the use of Boracure In tests of various wood-treating preparations entomologists of the Department of Scientific and Industrial Research demonstrated that Boracure's oil-soluble toxic (Pentachlorphenol) was entirely effective in the control of wood-boring insects. The tests covered several years' investigations, and Pentachlorphenol came through with flying colours. For instance,

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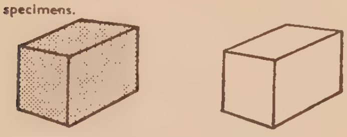
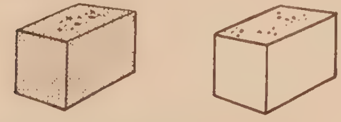
Even untreated control blocks had no eggs laid on them when used in tests near pentachlorphenol-treated blocks.



WITH WATER SOLUBLES

Eggs were laid almost as freely on blocks treated with water soluble toxics as on untreated control blocks alongside. Beetles did not die, eggs hatched and grubs lived for a considerable time.

Placing untreated control blocks alongside those treated with water solubles did not prevent profuse egg laying on controls during tests.



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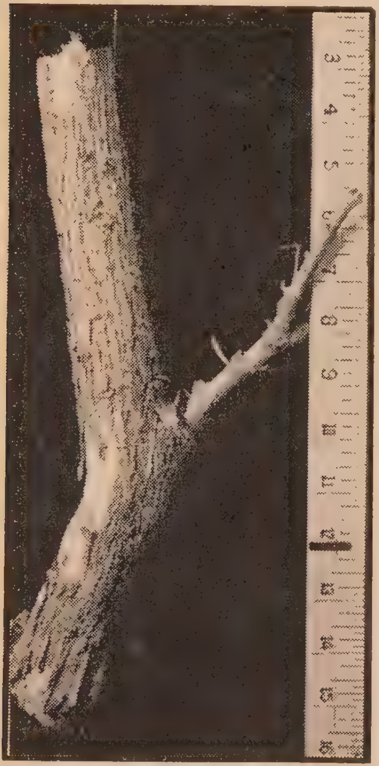
when the soil is in this condition, they should be "heeled in" (see page 647, June, 1947, issue) at once to await conditions more suitable for planting.

"Pricking over" is the term which gardeners use for shallow cultivation with a fork. Deep cultivation is very beneficial to the soil, but it is impracticable to dig deeply between such plants as shrubs, herbaceous plants, and roses, as that causes great damage to the roots of these plants, which would be seriously weakened as a result. On the other hand, soil which is continually cultivated by hoeing only soon becomes too fine, tends to lose its crumby structure, and cakes badly after rain. At least once a year the ground between shrubs, herbaceous plants, roses, and other permanent crops should be "pricked over" with a fork, the handle of which should be kept low so that the tines do not go too deeply into the soil, which should be left as lumpy as possible, no attempt being made to break the lumps down. At the same time any fallen leaves on the surface should be buried out of sight to rot and return humus to the soil.

Primroses or polyanthus will flower well in the house if lifted in midwinter and potted up into bowls. Each plant should be lifted carefully, the soil washed from the roots, and then planted in the bowl, packing moss or good potting compost firmly between the roots. Stand the bowl in a sunny position and water the plant only when the compost or moss feels dry to the touch, as overwatering will cause the roots to die and rot. The plants will grow and flower for weeks if potted in compost, but plants set out in moss show signs of starvation after a week or two and should then either be replaced by new ones or fed with the complete fertiliser often mentioned in these notes.



[*Photo News Ltd. photo.*

The leathery, purple-brown growth of silver leaf fungus growing on portion of a dead branch of an escallonia hedge. It is important that dead branches should be cut out and burnt as soon as they are noticed and before these growths have time to develop.

Concrete retaining walls are efficient but ugly. A variety of trailing plants can be used to change them into features of interest.

Sow seeds of summer bedding plants in boxes under glass in the mildest northern districts to provide a supply of plants for very early planting. Elsewhere it is still much too early to sow seeds, even under glass, as plants produced too early simply become starved in their boxes before they can be planted out.

Stakes are a most important item in the garden equipment and good stakes are worth looking after. Their life can be very much lengthened by treating the part which will go into the ground with creosote, and this should be done during the winter so that the stakes can dry out thoroughly before they are used. The best way to treat stakes at home is to stand them for a few minutes, pointed end downward, in a petrol tin of creosote, and then put them in a second tin to catch any creosote which may drain off them. Afterward stack the stakes under cover to dry out thoroughly. Stakes treated in this way should last for years.

Stones set in path edges, retaining walls, and rockeries should be made quite firm by ramming the soil thoroughly between, under, and around each stone as it is put in position. After each stone has been laid, and before another is added to a wall or rockery, it should be tested to make sure that it is perfectly rigid. However, even well-laid stones occasionally become loosened, especially after a dry season when the soil shrinks away from contact with the faces of the stones. A loose stone is a menace to safety, as it can easily result in a nasty fall if it is stepped on, and stone work should be examined carefully each winter. Loose stones should be taken out and relaid, making sure that the soil is replaced a little at a time and very firmly rammed as the work proceeds.

Sweet peas succeed best in a site which has been specially prepared for them, as described in detail in the December, 1947, issue of the "Journal." The sooner this work can be put in hand during the winter the better, providing the soil is not too wet, as it is an advantage to leave the site for some weeks to settle before the sweet peas are planted. Seed can still be sown in pots or boxes in a cold frame.

Weeds, like the poor, are always with us. During summer they are fairly easy to keep in check if the ground is hoed regularly, as seedlings die at once when cut off in good hot weed-killing weather. In winter, hoeing may disturb the weeds and move them about from one place to another, but many of them reroot into the moist soil and are soon growing again as strongly as ever. That does not mean, of course, that hoeing is not needed in winter. Whenever the surface of the soil is seen to be caked, especially when rain is followed by bright sun, the hoe should be used to crack the surface. Some weeds, such as chickweed, grow quickly in the cool, moist winter weather and are almost impossible to kill by hoeing. The only way to get rid of these weeds is to pull them out by hand with their roots, and this should be done before they seed. When hand weeding or doing any other work on a border the good gardener trains himself to move his feet as little as possible, reaching out as far as he can in all directions before stepping to another position, to avoid undue trampling of the soil.

Other Tasks for the Month

Sow **annuals** outdoors in very mild districts—calendulas, candytuft, poppies, scabious, sweet peas, etc.

Examine **begonia** and **gloxinia** tubers in store and cut out any pieces going bad.

Cut down old flower stalks of **chrysanthemum** and **dahlias** in the latest districts. Dig up and destroy unwanted varieties.

Sow **cyclamen** seed under glass. Feed plants coming into flower with dilute liquid animal manure or complete artificial fertiliser. Put a pinch of flowers of sulphur in the centre of each crown to reduce damping off.

Lift any **gladioli** that still remain in the ground and dry off the corms for storing.

Continue lifting, dividing, and replanting **herbaceous plants.**

Cut shoots of **jasmine** and put them in water indoors to open.

Take cuttings of pink **marguerites** and put them in a cold frame to root.

Prune **roses** in the very mild northern districts.

Pinch the tops out of **wallflower** plants that have not bushed out.

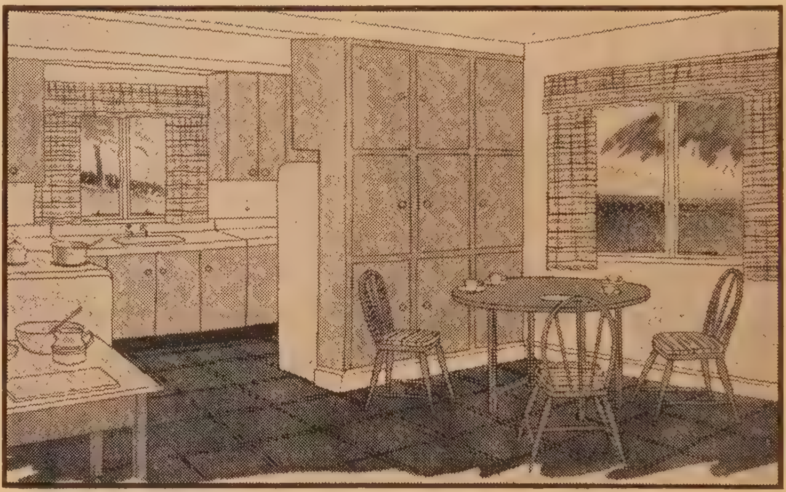
Reminders About Common Troubles

Thrips on gladiolus corms: Gladiolus corms should be examined from time to time and the skins removed from a few to see whether they are still in good condition. Brown, sticky staining of the flesh of the corm is usually a sign that the corms are infested with thrips, small active insects with slender, elongated bodies up to 1/10in. long when fully grown and ranging in colour from yellow to brown or black. Reports indicate that D.D.T. dust is effective in killing thrips in stored corms. A dust containing 5 per cent. of D.D.T. should be used at the rate of 1oz. of powder to each bushel of corms, which are then well shaken up in a bag to mix the powder thoroughly among them.

It is important to control thrips on gladiolus corms and not to plant the corms out while they are still infested with the insects, as that usually results in a heavy infestation on the new crops, which may be completely ruined if the season happens to be a dry one favourable to the rapid building up of a big population of thrips.

Escallonia hedges should be looked over for dead bushes or branches, which should be cut out at once and burnt. They have probably been killed by silver blight fungus, which is spread by spores produced on brown-purple growths that appear only on dead wood. Hence all dead branches or bushes should be cut out and burnt before these growths have time to form. A fuller account of this disease, which seems to be becoming much more common and troublesome on escallonia, was given on page 425 in the October, 1947, issue.

More Comfort, Less Work



HOW a large, inconvenient kitchen was altered to make the work of preparing meals easier and yet give a more comfortable family living room is shown in the sketch above. All the working parts of the kitchen are now grouped at one end, which is partly separated from the living area by a half wall of cupboards, serving the double duty of preventing draughts from the outside door and providing extra storage. On the kitchen side the high cupboards of the wall store preserves and other foodstuffs not in daily demand; the living room side provides plenty of space for table linen, cutlery, and china, cake and biscuit tins, school books, toys and games, and sewing and mending materials.

The table under the big window is in a pleasant place for eating and is so near the kitchen that many steps are saved when meals are being served. The small table standing by the stove is on trolley wheels and is easily moved to the point where it is most needed. Its top is linoleum covered to make it useful for baking or dishing up the dinner.

The walls in the kitchen part of the room have been finished in deep-ivory washable paint and the cupboards in fawn with dark brown for the recessed toe space under the sink. In the living area the walls are finished with deep ivory and fawn mottled paper. The cupboards match those of the kitchen, and the window woodwork is deep ivory.

Curtains and chair cushions of striped material in shades of green, fawn, brown, and henna accentuate the colours of the terrazzo sink bench. Comfortable chairs are grouped near the open fireplace, which is on the wall opposite the sink.

—*EVA TOPPING, Rural Sociologist, Auckland.*

FIRST STEPS IN CROCHET WORK

KNITTED garments are always in vogue and most girls learn to knit at school. Crochet work rises and falls in popular esteem; at present it has returned to favour and is appearing as dress accessories and for household use. Crocheting is not as widely learnt as knitting or sewing, and the directions in this article by Eva Topping, Rural Sociologist, Auckland, have been prepared for the guidance of beginners.

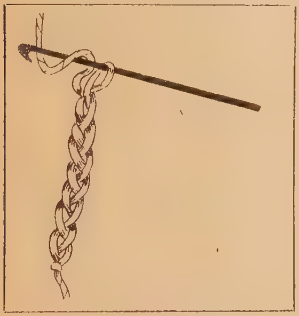
[*"New Zealand Free Lance" photo.*

Though it is not suggested that this is a suitable mark at which a learner should aim, it shows what can be done with a crochet needle. Two million stitches—more than 4000 to a row—went into the making of this English bride's dress, which occupied 1000 hours of her mother's spare time.

CROCHET work is considered by many to be simpler to learn than knitting. There are only a few basic stitches, and, if they are practised with a large hook and some odd lengths of wool, the knack of working even crochet will come quickly. First attempts should be made with a bone or plastic hook and wool or heavy knitting cotton; steel hooks and fine cottons can be used when the worker is more familiar with stitches and tension.

Chain Stitch (abbreviation, ch. st.)

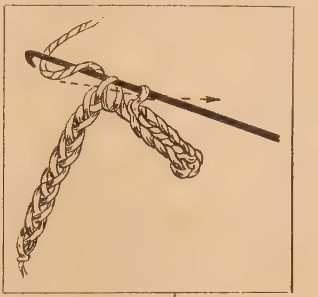
Hold the hook between the first finger and thumb of the right hand, in the same way as a pencil, and keep the second or third finger lightly on the loops as they are formed to help regulate the work. Make a slip loop at the end of the wool; hold it between the first finger and thumb of the left hand with the wool over the first and second fingers, under the third, and over or round the fourth. Put the hook through the loop, then under the wool from left to right, catch the wool, and draw it through the loop already on the hook. Repeat the stitch until the chain is the length required, keeping the left thumb and finger near the last stitch made. At first the loops may be of uneven size, but with a little practice it will soon be possible to keep them regular. This line of chain forms the foundation for the work and on it any of the following stitches may be worked.



Chain stitch.

Slip Stitch or Single Crochet (sl. st. or s.c.)

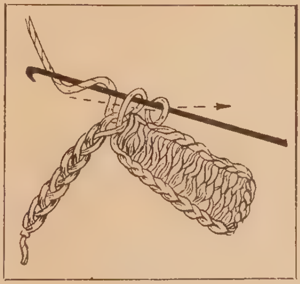
In practice, slip stitch is used mainly for joining or fastening, as it is very short and practically invisible. With the loop from the last chain stitch still on the hook, insert the hook into the first ch. st. to the left, catch the wool (by passing the hook under it from left to right), and pull it through both the chain stitch and the loop on the hook in one operation, thus making one single crochet or slip stitch. Repeat to the end of the row.



Slip stitch or single crochet.

Double Crochet (d.c.)

With one loop on the hook, insert it into the third chain stitch to the left. Put the hook under the wool, pull the loop through the chain stitch, hook under the wool again, and pull it through the two loops on the hook, making one double crochet. Repeat the stitch to the end of the row, turn the work, make two chain stitches (to represent the first double crochet), then * insert the hook into the two top loops of the next stitch, pull the wool through, hook under the wool, and pull it through the two loops on the hook; repeat from * to the end of the row. The double crochet is a most useful stitch which makes a firm, solid fabric. It can be varied slightly: If a smooth surface is required, the second and succeeding rows of stitches are worked as described into both loops of the stitch in the preceding row, but by working into the back loop only a ridged effect is obtained.

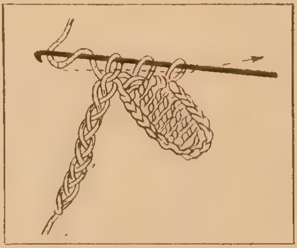


Double crochet.

Treble Crochet

Treble crochet gives a more open effect than either of the two stitches described and the rows are higher. There are variations in treble crochet, made by the number of loops on the hook and the manner in which they are worked. Smooth or ridged effects are gained by working into both loops of the stitch in the preceding row or into the back loop only, in the same way as explained for double crochet.

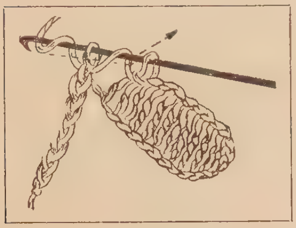
Half treble or short treble (h. tr. or s. tr.): Make a length of chain, miss two chain (to stand for the first half treble), pick up the wool by passing the hook under it from left to right, insert the hook in the next chain stitch (third from the hook at the beginning of the row), pull the wool through, hook under the wool again, and draw it through all three loops on the hook. Repeat the half treble in the next chain stitches for the required length. Turn with two chain and repeat.



Half treble or short treble.

Treble (tr.): Make a length of chain, miss three (to stand for the first treble), slip the hook under the wool, insert it into the next chain stitch (fourth from the hook), pull the wool through, hook under the wool, and pull it through the first two loops

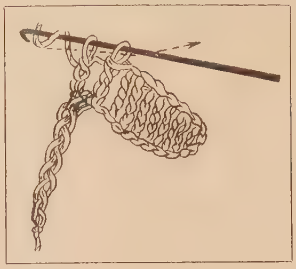
CROCHET STITCHES . . .



Treble (1)—Pull the wool through the first two loops on the hook.

on the hook; hook under the wool again, and pull it through the remaining two loops on hook, thus completing one treble. Repeat to the end of the row. Turn with three chain.

Double or long treble (d. tr. or l. tr.): This stitch is one loop higher than treble. Make the length of chain and miss four (to stand for the first long treble). Put the hook under the wool twice, insert it into the next chain stitch, catch the wool, and draw the loop through the chain; hook under the wool and draw it through the first two loops; catch the wool again and draw it through the next two loops; catch the wool and draw it through the last two loops on the hook. Repeat for the desired length. Turn at the end of the row with four chain. Triple trebles and even quadruple trebles are sometimes required for a pattern; these two stitches are worked in the same way as double treble except that the wool is picked up three times and four times (as the names imply) before starting the stitches and then worked off two loops at a time.

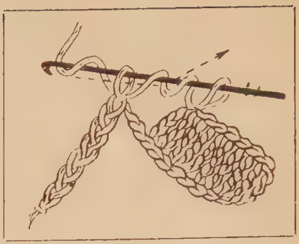


Treble (2)—Pull the wool through the last two loops on the hook.

From these basic stitches almost any pattern is built—either close patterns for garments, dress accessories, and household goods, or fancy openwork patterns for lace, bed linens, and table use.

Increasing and Decreasing

For shaping, decreasing is attained by missing one stitch of the preceding row at appropriate places, and for increasing two stitches are worked into one stitch of the preceding row.



Long treble. Pull the wool through the first two loops; hook under the wool and pull it through the next two loops; hook under the wool and pull it through the last two loops.

Joining Wool

When a short length of wool is left, take the end of the new ball and work one stitch with the new and one with the old alternately until the old ball is finished. Darn in any loose ends.

ALL-OVER CROCHET PATTERNS

When practice has brought confidence in the use of the basic stitches, here are some patterns in which they can be used:—

Shell Pattern

Work into both loops of stitches after the first row. Make a length of chain.

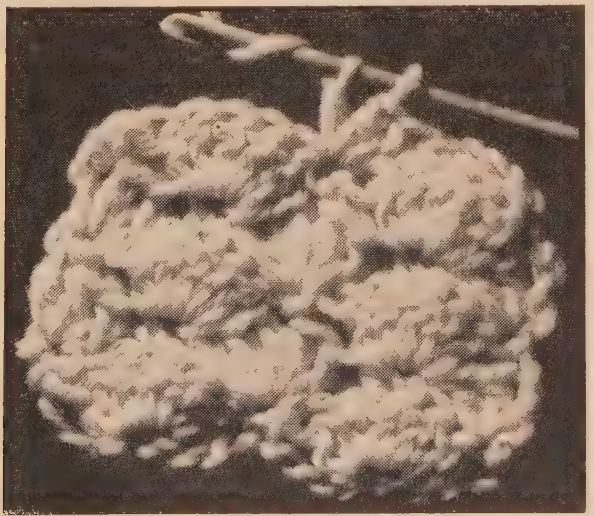
First row: Miss 1 stitch, 1 d.c. in the next, * miss 3 ch., 5 tr. in the next, miss 3 ch., 1 d.c. in the next. Repeat from * to the end of the row; turn.

Second row: 3 ch. (to represent first tr. stitch), 2 tr. into the d.c. of the row below, 1 d.c. into the centre st. of tr. group, * 5 tr. in next d.c., 1 d.c. in centre of next tr. group. Repeat from * to the end of the row, finishing with 3 tr. (half a group) in the last d.c.; turn.

Third row: 1 d.c. in 1st tr. of half group, * 5 tr. in the d.c., 1 d.c. in centre of tr. group. Repeat from * to the end of the row; turn. Repeat the last two rows until the required size is reached.

Crazy Pattern

Make the required length of chain.



[*Sparrow Industrial Pictures Ltd. photo.*
Shell pattern.

[*Sparrow Industrial Pictures Ltd. photo.*
Crazy pattern.

First row: Miss 3 ch., 3 tr. in the next stitch, miss 3 ch., 1 d.c. in the next, * 3 ch., 3 tr. in the same st. as last d.c., miss 3 ch., 1 d.c. in the next. Repeat from * to the end of the row; turn.

Second row: 3 ch. 3 tr. in the 1st d.c., 1 d.c. in the chain loop along the top of the treble group of the preceding row, * 3 ch. 3 tr. in same ch. loop as d.c. was worked in, 1 d.c. into chain loop of the next tr. group. Repeat from * to the end of the row; turn. Repeat the second row as required.

Star Pattern

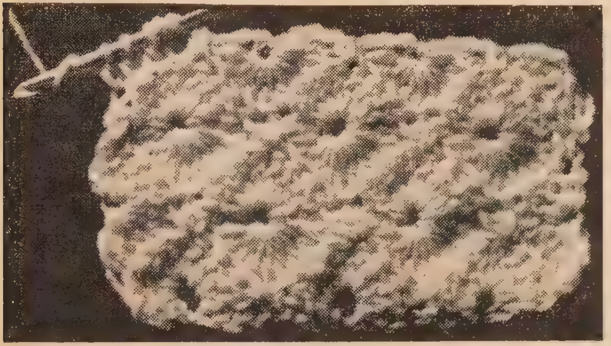
Work in the back loops only of stitches. Make a length of chain stitch.

First row: * Miss 3 ch., 8 tr. in the next, miss 3 ch., d.c. in the next. Repeat from * to the end of the row; turn.

Second row: Make 3 ch., * hook under the wool, draw a loop through the back loop of the first treble below, hook under the wool and draw it through two loops on the hook (this is an unfinished treble and leaves two loops on the hook). Repeat from * into the next 3 tr. (making five loops on the hook), then hook under the wool and draw the loop through all those on the hook; 4 ch., 1 d.c. into last treble used, taking both strands to prevent a hole, * 3 ch. 4 unfinished trebles in the same shell below, 1 unfinished tr. in the d.c. below and 4 unfinished tr.; in the first 4 trebles of the next shell (making 10 loops on the hook) hook under the wool and draw a loop through all 10 loops on the hook; 4 ch. 1 d.c., through two strands of the last treble used. Repeat from * to the end of the row, finishing with 3 ch. and half a shell (five loops on the hook); turn.

Third row: 3 ch. 4 full treble in the little eyelet of the preceding row, * 1 d.c. over the d.c., taking it into the row underneath, 8 full treble into the eyelet of the next shell. Repeat from *, ending with half a shell (that is a group of 4 trebles); turn.

Fourth row: 3 ch., * work 1 unfinished tr. into each stitch to the centre of the tr. shell (9 tr., leaving 10 loops on the hook), hook under the wool and draw the loop through all 10 loops, 4 ch. 1 d.c. through two strands of the tr. last used, 3 ch. Repeat from * to the end of the row, finishing with 1 d.c. at the top of the last half shell.



Star pattern. [*Sparrow Industrial Pictures Ltd. photo.*

Fifth row: * 8 full treble in eyelet, 1 d.c. over d.c. (as in third row). Repeat from * to the end of the row. Repeat the last four rows to the required length.

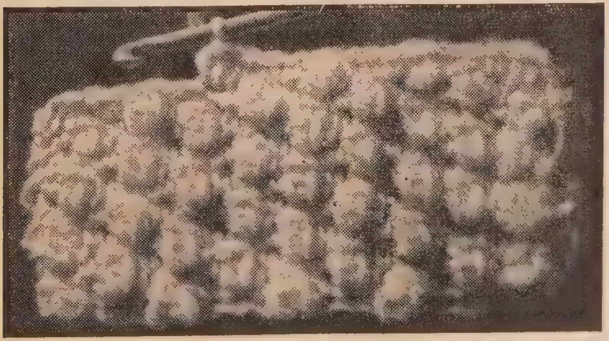
Rosebud Pattern

Work into both loops of stitches. Make the length of chain required.

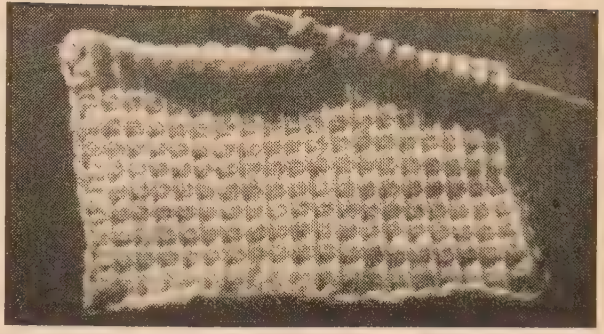
First row: 1 d.c. in the third stitch from the hook, * hook under the wool, then draw a loop through the next stitch, hook under the wool and draw it through the first two loops on the hook, hook under the wool and draw the loop through the same stitch, hook under the wool and draw it through two loops again, then draw another loop through the remaining three on the hook, 1 d.c. in each of the next three stitches. Repeat from * to the end of the row, but finish with 1 d.c. only. Fasten off.

Second row: Start again at the beginning of the first row with 3 d.c.; taking up both loops of the stitches, work the raised stitches between those of the previous row, end with 3 d.c., and fasten off.

Third row: 1 d.c. in the first stitch, then work the raised stitches between those of the second row, ending the row with 1 d.c. Repeat the last two rows to the depth required. Darn in loose ends of wool.



Rosebud pattern. [*Sparrow Industrial Pictures Ltd. photo.*



[*Sparrow Industrial Pictures Ltd. photo.*
Tricot, Afghan, or knitting pattern.

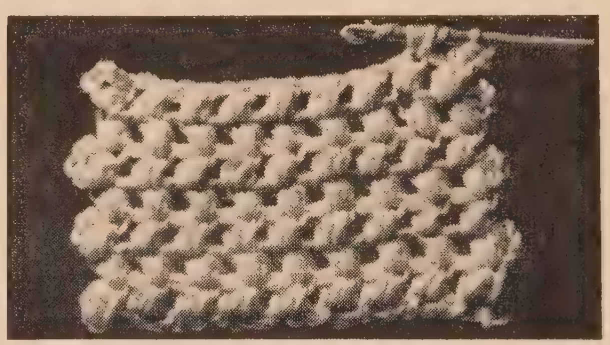
Tricot, Afghan, or Knitting Pattern

This stitch gives a smooth and attractive surface. As many loops are carried on the hook at one time, a long hook is necessary. When the article being made is very wide, tricot stitch strips are worked and joined to give the required size.

Make the required length of chain.

First row: Miss 1 ch., then draw a loop through each chain stitch, leaving the loops on the hook as if knitting. When the end of the chain is reached, put the hook under the wool and draw it through the last loop; * hook under the wool and draw it through the next two loops. Repeat from * to the end of the row, leaving one loop on the hook.

Second row: The loop on the hook is the first stitch. Draw loops through the next and succeeding stitches—that is through the top of each perpendicular stitch of the preceding row. Work back as in the first row. Repeat the second row for the length required, then work 1 d.c. into each perpendicular stitch to finish off.



Blanket pattern. [*Sparrow Industrial Pictures Ltd. photo.*

Blanket Pattern

Make the length of chain.

First row: Hook under the wool and draw a loop through the fourth chain from the hook; repeat twice, giving seven loops over the hook. Hook under the wool and draw the loop through all seven on the hook, 1 ch., * (miss 1 ch., hook under the wool, draw the loop through the next stitch) three times (seven loops on the hook), hook under the wool, draw the loop through all the loops on the hook, 1 ch. Repeat from * to the end of the row; turn.

Second row: 3 ch., then work as for the first row, placing each cluster of stitches over the ones in the preceding row.

Beginners should use some odd lengths of four-ply wool and a No. 8 crochet hook. Try making small pieces of some of the fabric patterns described to become familiar with the use of the hook and with the stitches.

TWO UNUSUAL DESIGNS FOR HANDBAGS

SOMETHING new in handbags is offered by these two unusual and intriguing designs, neither of which is difficult to make.

Pleated Bag

Materials required to make the pleated bag are a piece of felt 27in. by 22in., lining material 16in. by 28in., stiffening material 17in. by 10½in. for the bag top and base, a 9in. slide fastener, two press studs, and some gilt studs.

Make a paper pattern from the left-hand diagram, lay it on the felt, and cut out, leaving ¼in. turnings. Also cut out in stiffening and felt, leaving ¼in. turnings on felt only, an oval 17in. long by 2in. deep for the base and two felt ovals and one stiffening oval 9in. long by 3½in. deep for the top.

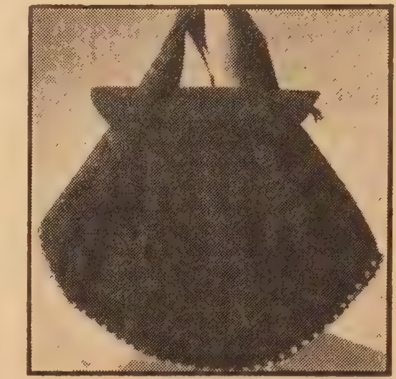
Pleat up the sides of the bag so that the top measures 8in. and tack them. Lay on the lining material and cut it out, leaving ½in. turnings. Also cut out a base shape. Cover both pieces of stiffening with felt ovals, turn the edges over on to the wrong side, and catch stitch them. Place the second top oval on the wrong side of the top, turn in the edges, and hem neatly.

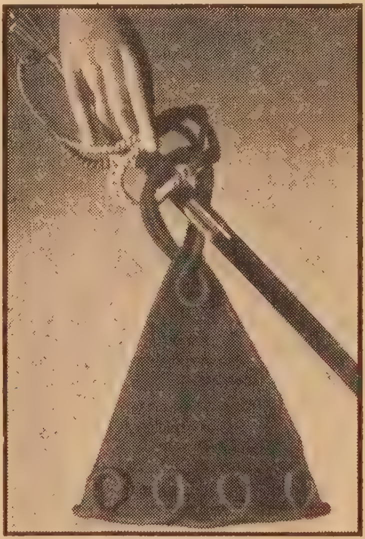
Stitch the side seams of the felt and fold the gussets inward down the dotted line. Insert the base at right angles to the sides, turn in the lower edges of the sides, and oversew the edges together. Stitch the side seams of the lining, then insert the lining base and stitch. Slip the lining into the bag, wrong sides together. Turn in the raw edges at the top of the bag and neatly stitch the lining to the felt.

Sew a tiny piece of felt on to the slide fastener for a tab. Stitch the fastener along the top edge of the bag, placing the end with the tab to a gusset seam and leaving the other end dangling over the edge; neaten the ends.

Stitch one edge of the top oval to the bag 1in. below the fastener; bend it in half lengthwise so that it covers the fastener and makes the front flap. Sew half a press stud to each end of the front flap and the other halves to the bag to correspond.

Cut two lengths of felt 14½in. by 2in. for the handles. Oversew the edges and press them so that the seam is in the centre of the wrong side. Stitch the ends of one handle to the front side 2in. below the fastener and ½in. in from the first pleat. Stitch the other to the back to correspond. Stitch some gilt beads round the base of the bag.





Make a small purse to go inside from a piece of felt 9in. by 4in., a piece of lining of the same size, and a piece of stiffening 8½in. by 3½in. Cut off the corners of one narrow end for the front flap and cover the stiffening with felt and lining material as for the bag. Fold the material into a 3in. pocket and firmly oversew the sides. Sew on a small press stud for fastening.

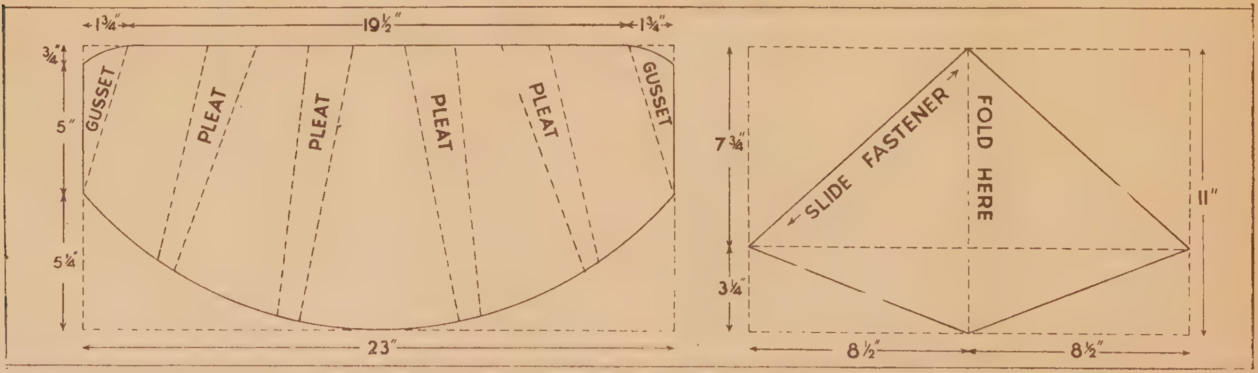
Three-cornered Bag

For the three-cornered bag the materials required are a piece of felt 18in. by 24in., a piece of lining material the same size, a piece of stiffening 17in. by 20in., 2 yards of cord, and a slide fastener 8½in. long.

Make a paper pattern from the right-hand diagram and an oval 8½in. by 2in. Lay on the stiffening and cut it out exactly, but leave ¼in. for turnings on the felt and lining.

Lay the stiffening on the felt, turn the felt edges over on to the stiffening, and hem neatly without taking the stitches through. Place the lining on the stiffening, wrong sides together, turn in the raw edges, and slip-hem. Fold the bag into shape, insert the slide fastener down the open side, starting at the top, and stitch. Neatly oversew down the remainder of the seam. Insert the base at right angles to the sides, keeping the ends at the folded edge and seam, and oversew the edges.

Cut two 18in. lengths of cord for the handles and leave the remainder to decorate the base. Cover all the cord with felt strips as before. Make the handles into shapes of eight, keeping one loop smaller than the other; stitch the small loop to the top of the bag. Loop the cord round the base of the bag as shown in the illustration and stitch it firmly in place. Make a small purse to go inside from the instructions given for the first bag.



MODERNISING AN OLD KITCHEN

By **NORMA K. METSON,**
Rural Sociologist, Wellington.

MANY houses built 50 or more years ago have features which make them desirable homes today. As a legacy from those less-hurried times, they have durable heart timber, sound workmanship, and, best of all, space, so that there is room for children to play and guests to sleep. But old kitchens have less to commend them, and when the housewife has the extra work of keeping a large house in order it is doubly important that her kitchen should be convenient.

[Sparrow Industrial Pictures Ltd. photo.

WITH building costs high, materials scarce, and housing space more precious than ever before, modernising an old house is probably a better plan than trying to build a new one. Perhaps the farm housewife has sighed for a neat, compact bungalow like her town cousin's, only to find when it is built that she has acquired merely a new set of inadequacies. An alternative and in many cases more satisfactory solution would be to modernise, adding storage space, windows, and perhaps a sunporch to the living room and bedrooms, and bringing the kitchen up to date with new equipment and compact cupboards.

Many people used to the drabness of an old kitchen, and conscious only of its many deficiencies, fail to see the possibility of improvement. Then, suddenly, a magazine article, or an account of what a new arrival has done to "the old place up the road," or a little extra spare time inspires action. It becomes obvious that the table could be moved or cupboards built, vague plans born of years of unsatisfactory routine materialise, and work begins. Even as simple a thing as a coat of light-coloured paint for upper walls and ceiling makes an almost magical change.

Unsatisfactory Features

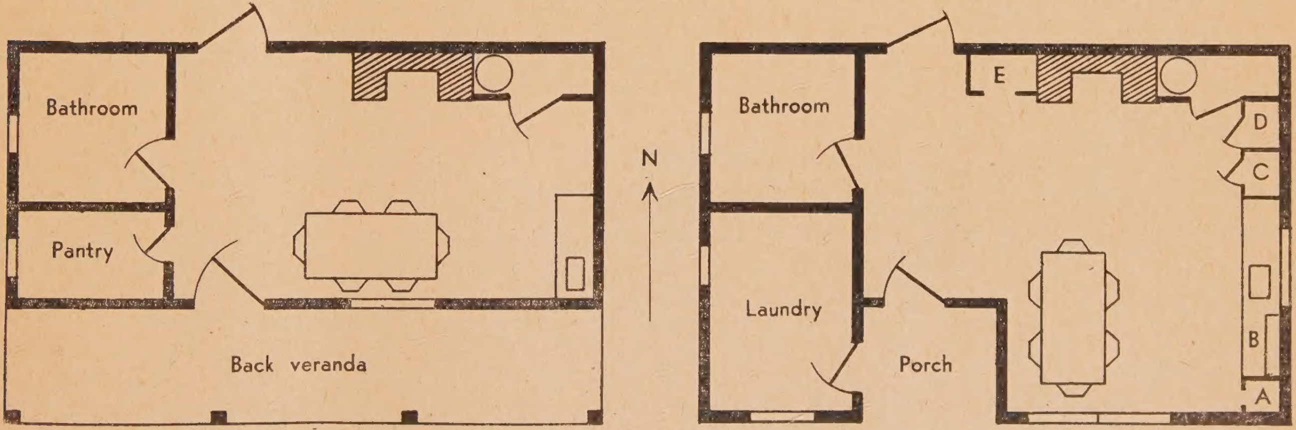
The chief impression of many old kitchens is one of darkness and gloom, caused by dark paint and paper on walls and ceiling, too few windows, and the blocking of light from existing windows by porches and verandas built on later. In addition to the general gloom, stove and sink are often in the darkest corners or placed so that the worker is always in her own light, and the artificial light from one inadequate fixture in the centre of the room does little to improve things.

Complaints that the kitchen is too large are not common, but the space is often badly arranged, and much time and energy are wasted going between stove and sink, pantry and dining table, scattered about a large room or separated in several small ones. Rearrangement so that work can follow a logical sequence, and planned storage space where it is most needed, will make a great difference.

A kitchen equipped with a fuel range and a sink with running water and drain is modern by some standards but cannot be regarded as really satisfactory. Lack of equipment, old-fashioned or inefficient articles, shortage of convenient and classified storage space, benches too small for working on—these deficiencies can be grouped together under the heading of inadequate facilities.

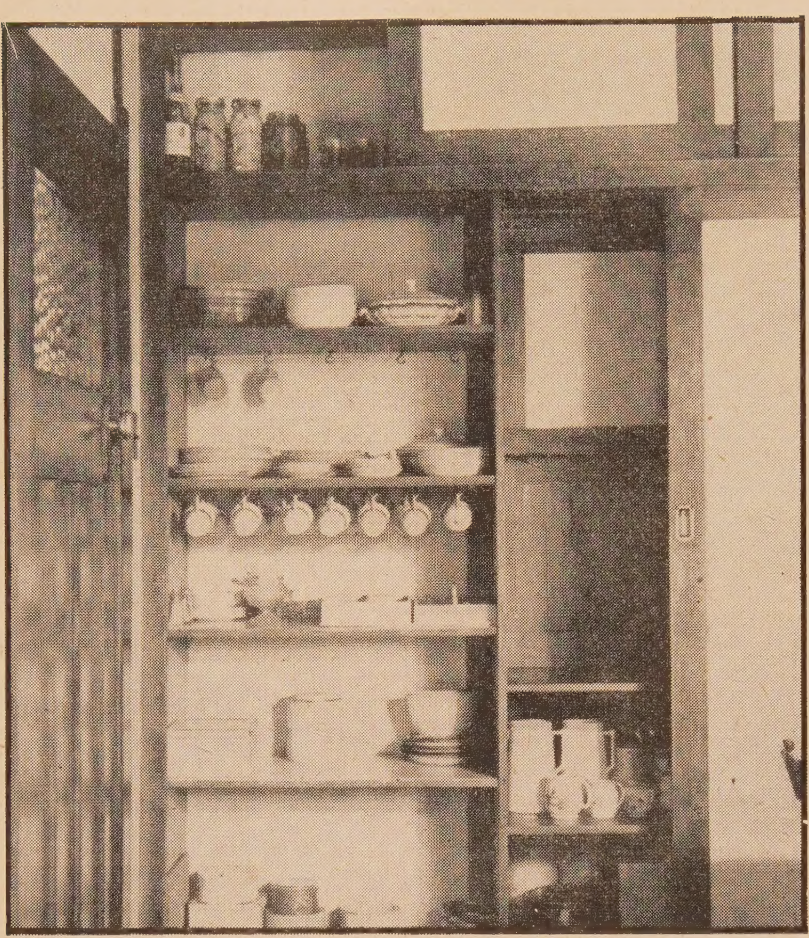
Remedying Deficiencies

What can be done to remedy these deficiencies and achieve a room with all modern conveniences? Some families, having decided to make changes, feel that everything must be done at once. Others, especially if the work is being done by the home handyman, prefer to make alterations and additions in stages as time and money permit. In the latter case it is particularly important (the point



Before and after: How a kitchen area could be remodelled. A—Safe. B—Bench extension with cupboard above and bins below. C—Cupboard for groceries. D—Cupboard for utensils. E—Cupboard for cleaning equipment and supplies.

MODERNISING A KITCHEN



A storage wall with sliding doors. The pass-cupboard at the right communicates with the dining room.

has been mentioned before in other connections) to have all plans completed at the start. Work then is not haphazard, duplication is avoided, and each job done contributes toward a whole visualised from the beginning.

This whole—a modern kitchen—will include sink with running hot and cold water and drainage, electric or up-to-date fuel range, built-in cupboards and benches which provide adequate storage room and work surfaces, good natural and artificial lighting, sufficient space for work to be done and, if desired, for meals to be served, and safe storage for perishable foods—a large, well-ventilated safe or preferably a smaller safe and a refrigerator. Improvements may be minor, involving no structural changes but, for example, repainting, rearranging movable articles, or small additions such as a set of shelves or a kitchen stool. New equipment may also be added without altering the room as a whole—for example, the installation of an electric stove to supplement the coal range, or of a refrigerator or new sink unit. On the other hand, it may be decided that considerable structural alterations are necessary before the room will be satisfactory—removal of partitions, new windows to let in the sun, a built-in storage wall, or conversion of the pantry into a dining alcove. If both structural changes and new equipment will be needed (and that is usually so), it is wise to do the pulling down and new building as the first step. The room will be basically improved, and later more equipment can be fitted into the space planned for it.

Value of Scale Plan

Before making any changes draw a scale plan of the room, ¼in. to 1ft. Take accurate measurements with a yardstick or carpenter's rule, allow for thickness of walls, and mark all features such as windows, doors, cupboards or shelves already built in, and location of equipment. Using this plan as a guide, make several rough sketches of ideas for changes. By studying the plan instead of the room itself new possibilities will be seen. From the sketches the best plan will gradually emerge; redraw this to the same scale and alongside the original plan. Changes to be made will then be obvious, and it will be much easier to make the owner's wishes clear to the builder or architect.

Consider the aspect of the room: A new window in an east wall will allow desirable morning sun into the room, but midday sun from the north may make it unpleasantly hot. Changing the position of the sink may mean extra drains but a saving in supply pipes and hot water. If the old range is to be discarded, the new electric stove can be put somewhere quite different—indeed, a new overseas idea is to have hotplates and oven separate so that they can be installed independently, the hotplates next to the sink bench, for example, and the oven at the baking bench. In a room with many doors see if it is possible to reroute traffic, keeping it at one end.

Doing away with pantry and scullery means the loss of a good deal of room. Their functions can be carried on just as efficiently in a smaller space, but it must be well planned. A compact storage wall, for example, 18in. deep and built along one side of the kitchen, will hold bottled fruit in the top layer of cupboards, china and groceries in the middle section, and bulk supplies and cooking dishes below; 8ft. x 1ft. 6in., or 12 sq. ft. of floor space, thus takes everything which was once put in the 6ft. x 6ft. pantry—three times the space and three times more difficult to keep tidy.

In the room illustrated in the heading photograph the delightful, sunny dining alcove was once a pantry which opened not into the kitchen but into a scullery. The scullery was abolished, the sink brought into the main room, storage transferred from the pantry to adequate cupboards, and the pantry enlarged and given new windows and an entrance through an archway.

Many other such successful changes have been made. A scullery can become a laundry, back bathroom, men's washroom, or even a kitchenette. Some old kitchens, where the stove was the only equipment, have had an open fire put in its place and become most attractive family dining-living rooms, with kitchen work moved out to the "scullery" or a new working kitchen made somewhere else—perhaps in the old back bedroom which frequently opens off a kitchen.

When remodelling is planned, keep in mind the basic kitchen work units which have been discussed in these articles, and the standard plans—they are good to start from, though compromises will certainly have to be made because walls, chimneys, and plumbing cannot be changed at will.

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